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PLANT INDUSTRY BRANCH
NEW BRUNSWICK DEPARTMENT OF AGRICULTURE
AND RURAL DEVELOPMENT

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INTRODUCTION

This 1982 Adaptive Research Report is the fourth annual publication of the results of trials and demonstrations carried out by Plant Industry Branch personnel. This Report is published to enable producers and other agricultural workers to have access to project findings. Further information about any particular project can be obtained by contacting the respective author(s) directly.

The authors are congratulated for their dedication and effort in conducting the projects and thanks is extended on their behalf to producers and agencies that provided assistance and co-operation.

Special acknowledgement is given to Mr. David B. Finnamore for continuing to serve as editor of this Report.

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Acknowledgement is made to the Word Processing Center for carefully typing the papers, to the Communications Section for printing and binding the publication and to the Translation Bureau for translating the reports. Comments and suggestions that would lead to improving future issues of this Report are solicited.

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EVALUATION OF THE EFFECTS OF CALCIUM FOLIAR SPRAY ON QUALITY AND YIELD OF MCINTOSH APPLE

BY

I. GHANEM, R. BUCHANAN AND E. ESTABROOKS

Abstract: The effects of calcium sprays on controlling calcium related disorders are being evaluated in two commercial orchards, one having young trees and the other having mature trees.

Two calcium sources, calcium chloride and calcium chelate at different frequencies of application are being tested. Records of fruit firmness, degree of maturity and yield data were taken. As a result of the calcium foliar sprays, the calcium levels in the leaves of the young orchard increased substantially, while in the mature orchard, no obvious increase in leaf calcium was detected.

INTRODUCTION: Since calcium is less available in acid soils, liming programs are essential where pH is low. However, in some cases where the soil is limed, calcium levels in the leaves and fruit has been observed to be low. Factors, such as drought, high K/ca and Mg/ca ratios has been attributed to cause calcium deficiency. Calcium deficiency may cause bitter pit, softening and breakdown of the fruit during storage. Under these circumstances, foliar sprays with calcium salts or calcium dip of the fruits have been recommended as methods of control.

Generally, calcium chloride is the most effective material, however, leaf injury from this salt limits its use unless the necessary precautions are taken. The objective of this trial is to compare calcium chloride sprays with calcium chelate sprays under two spraying schedules. Also, the response of young and mature trees to the above-mentioned treatment is compared.

MATERIALS AND METHODS: The treatments under study are described in Table I. The first spray was applied in mid-June and the other sprays were applied at two week intervals.

Each treatment consisted of single trees, replicated five times. The trial was conducted on mature trees at Gagetown, N. B., and it was repeated on young trees at Keswick Ridge.

RESULTS AND DISCUSSION: Leaf samples were collected on August 4, 1982. The calcium results are shown in Table II. All calcium treatments appear to have increased leaf calcium in the young orchard but not in the mature block. Leaf levels of potassium and magnesium were generally lower than desirable at both sites but varied little between treatments.

Leaf burn was observed in the orchard where the high application rate of calcium chloride was used (treatment #2). The orchardist must pay careful attention to the rate of application when using calcium chloride spray as well as the weather. Applications during hot, dry weather have been reported to cause burning.

It is also noted that calcium chelate sprays reduced calcium levels in the leaves. This may be attributed to higher mobility of calcium within the tree when it was applied in the chelate form.

This trial should be carried out for at least another year to monitor the long term effects of these treatments.

Fruit was harvested and samples were collected during the first week of October. Yield data as shown in Table III shows some variability between treatments. Treatment #2 (high level of calcium chloride where burning of leaves occurred) appears to have reduced yields.

The starch text (iodine) and pressure tests (Magnus-Taylor pressure tester) did not show any significant differences due to treatments (Table IV).

CONCLUSION: In the young tree orchard, calcium levels in the leaves increased from 0.65% in the control, to 0.80% and 0.82% where calcium chloride was applied, and to 0.70% and 0.73% where calcium chelate was applied.

It seems that at the deficient level of calcium in the young orchard, calcium chloride and calcium chelate were effective in increasing the calcium level in the leaves. However, the deficiency situation cannot be corrected by one or two seasons of calcium applications.

The high rates of calcium chloride caused leaf burn (treatment #2) in both blocks and appears to have resulted in reduced yields.

Table (1) Treatments

Treatment	Calcium Source	Number of Applications	Rates of Application
1.	Calcium Chloride 20% Ca	6	5 kg/1000 l/ha
2.	Calcium Chloride 20% Ca	(A) 3 (B) 3	5 kg/1000 l/ha 10 kg/1000 l/ha
3.	Calcium Chelate 6% Ca	3	7.2 kg/1000 l/ha
4.	Calcium Chelate 6% Ca	(A) 1 (B) 5	3.6 kg/1000 l/ha 7.2 kg/1000 l/ha
5.	Control	0	0

Table (2) Leaf Analysis

Treatments	Young Trees				Mature Trees			
	N%	K%	Mg%	Ca%	N%	K%	Mg%	Ca%
1.	2.1	0.82	0.21	0.80	1.88	0.88	0.15	1.1
2.	2.02	0.80	0.19	0.82	1.92	0.88	0.13	1.15
3.	2.1	0.83	0.20	0.70	1.92	0.83	0.14	1.03
4.	2.14	0.87	0.20	0.73	1.84	0.84	0.14	1.02
5.	2.04	0.77	0.20	0.65	1.96	0.84	0.14	1.10

Table (3) Fruit-Yield from Calcium Treated Plots (1982)

(Averaged over 5 Replicates)

Treatment Number	Young Trees kgs/tree	Young Trees (kgs/hectare)	Mature Trees kgs/tree	Mature Trees (kg/hectare)
#1	34.3	(20,451.6)	145.6	(17,180.8)
#2	29.0	(17.342.0)	148.8	(17,558.4)
#3	40.9	(24,458.2)	190.1	(22,431.8)
#4	31.5	(18,837.0)	218.3	(25,759.4)
#5	31.2	(18,657.6)	218.5	(25,783.0)

Table (4) Average Starch and Pressure Tests of Calcium Sprayed McIntosh Apples at Harvest

Treatment Number	Young Trees tested Sept. 30/82		Mature Trees tested Oct. 4/82	
	Starch Test Scale (1-9)	Pressure Test (kgs)	Starch Test Scale (1-9)	Pressure Test (kgs)
#1	6	7.4	5.5	8.1
#2	7	7.5	6	8.3
#3	6	7.5	5	8.4
#4	6	7.4	5.5	8.5
#5	6	7.6	6	8.2

In the mature orchard, the leaf calcium levels in the control treatment were higher than those of the calcium chelate treatments. In the calcium chloride treatments, the leaf calcium levels were the same as that of the control treatment.

Thus the calcium levels were not affected by either calcium chelate or calcium chloride foliar sprays.

Other factors are expected to be affecting the yield in this trial. Thus there is no obvious yield response to calcium treatments.

REFERENCES: Webster, D. H. Influence of Hydrated Lime, Gypsum and Nitrogen Source on Bitter Pit of Apple. Annual Report of Kentville, Research Station, Nova Scotia 1980, p. 24-25.

Bramlage, W. J. and Mack Drake. 1980. The Way You Fertilize Your Fruit Trees Can Affect The Quality of the Fruit You Harvest. Fruit Notes. Vol. 45 #3. University of Mass. May/June 1980. p. 1.

ACKNOWLEDGEMENT: The authors wish to express their appreciation to Mr. D. Jones and Mr. H. Estabrooks for their cooperation and assistance in conducting this trial.

Thanks also are due to Niagara Chemical, Division of Reichhald Ltd., for supplying the Ca-chelate source.

THE EFFECT OF ZINC FOLIAR SPRAY ON QUALITY AND YIELD OF McINTOSH APPLE

BY

I. GHANEM, R. BUCHANAN, E. ESTABROOKS

Abstract: The effect of zinc foliar sprays on controlling zinc deficiency is being evaluated in two commercial McIntosh apple orchards, one having young trees and the other having mature trees.

Two zinc sources: zinc sulfate and zinc chelate are being evaluated. Also, time of foliar application; summer versus fall are being compared.

Records of fruit firmness, degree of maturity, zinc levels in apple leaves and yield data were taken.

INTRODUCTION: Leaf analysis of apple orchards in the province indicates the incidence of zinc deficiency in some of these orchards. Zinc sulfate sprays are generally recommended for zinc deficiency correction. It has been reported in Maine, that 25% increase in yield can be attributed to zinc foliar applications. The objective of this project is to compare zinc sulfate and zinc chelate in terms of their effect on apple yield and quality. Timing of foliar spray is also being evaluated.

MATERIALS AND METHODS: The treatments under study are described in Table I. Foliar applications were made in mid-June, July 9th and mid-October, 1981 according to schedule. During the second year of the trial, zinc sprays were applied in a similar manner.

Each treatment consisted of a single tree replicated five times. The trial was conducted on young trees at Keswick Ridge and repeated on mature trees at Kingsclear.

RESULTS AND DISCUSSION: Zinc foliar sprays applied in June, 1982 both chelate and sulfate forms, increased the leaf zinc levels in the mature orchard where zinc levels were deficient. No increase in zinc levels was observed with the October application for either the chelate or sulfate form of zinc. This may possibly due to the limited uptake by leaves in the fall. The correction of zinc deficiency can be achieved by foliar sprays during the month of June.

TABLE I TREATMENTS/1982

TREATMENT #	ZINC SOURCE	NUMBER OF APPLICATIONS	RATES OF APPLICATION	DATES OF APPLICATION
1	Control	0	0	-
2	Zinc Chelate	1	1.2 kg/1000L/ ha	June 15, 1982
3	Zinc Chelate	2 {1 1	1.2 kg/1000L/ ha 2.4 kg/1000L/ ha	June 15, 1982 June 28, 1982
4	Zinc Chelate	1	7.2 kg/1000L/ ha	Oct. 15, 1982
5	Zinc Sulfate	1	0.5 kg/1000L/ ha	June 15, 1982
6	Zinc Sulfate	2	0.5 kg/1000L/ ha	June 15, 1982 June 28,82
7	Zinc Sulfate	1	3 kg/1000L/ ha	Oct. 15, 1982

NOTE. The above treatments were applied at the same frequency, during the first year of the trial, with the exception of treatment #3, which received 2 sprays at the lower rate shown.

TABLE II Leaf Analysis, Yield Data (Averaged Figures) Young Trees.

Treatment #	Sample Date	Young Trees					Yield Oct. '82 kgs/ha
		N	P	K	Mg	Zn	
1	Aug 1981	1.9	0.18	1.25	0.26	66	18,179
Control	Aug 1982	2.0	0.15	0.90	0.24	77	
2	Aug 1981	2.5	0.17	1.15	0.24	50	17,820
Zinc Chelate	Aug 1982	1.9	0.15	0.86	0.25	90	
3	Aug 1981	2.4	0.17	1.16	0.24	74	19,794
Zinc Chelate	Aug 1982	2.0	0.14	0.83	0.26	84	
4	Aug 1981	2.6	0.17	1.17	0.24	73	14,711
Zinc Chelate	Aug 1982	2.0	0.14	0.95	0.24	80	
5	Aug 1981	2.4	0.17	1.15	0.24	78	16,086
Zinc Sulfate	Aug 1982	2.0	0.14	0.85	0.24	80	
6	Aug 1981	2.5	0.16	1.23	0.25	77	17,402
Zinc Sulfate	Aug 1982	2.0	0.14	0.85	0.28	75	
7	Aug 1981	2.5	0.17	1.13	0.25	70	22,784
Zinc Sulfate	Aug 1982	2.0	0.14	0.90	0.24	69	

TABLE III Leaf Analysis, Yield Data (Averaged Figures) Mature Trees.

Treatment #	Sample Dates	Mature Trees					Yield Oct. '82 kg/ha
		N	P	K	Mg	Zn	
1	Aug 1981	N/A	0.13	1.24	0.28	36	35,920
Control	Aug 1982	2.1	0.12	0.88	0.19	15	
2	Aug 1981	N/A	0.12	1.30	0.28	41	31,488
Zinc Chelate	Aug 1982	2.2	0.12	0.93	0.26	30	
3	Aug 1981	N/A	0.13	1.20	0.27	30	40,691
Zinc Chelate	Aug 1982	2.2	0.14	1.05	0.22	53	
4	Aug 1981	N/A	0.12	1.21	0.28	35	43,592
Zinc Chelate	Aug 1982	2.2	0.14	0.95	0.21	18	
5	Aug 1981	N/A	0.13	1.22	0.29	35	34,180
Zinc Sulfate	Aug 1982	2.2	0.12	0.89	0.20	30	
6	Aug 1981	N/A	0.13	1.25	0.27	44	37,220
Zinc Sulfate	Aug 1982	2.1	0.12	0.89	0.19	34	
7	Aug 1981	N/A	0.13	1.27	0.27	32	39,071
Zinc Sulfate	Aug 1982	2.1	0.12	0.91	0.21	18	

TABLE IV Average Starch and Pressure Tests (Scale 1-9) 1981-1982 Results.

Treatment No. #	Test Dates	Young Trees		Mature Trees	
		Starch Test	Pressure Test (Kgs)	Starch Test	Pressure Test (Kgs)
1	Sept 1981	5.5	6.9	3.5	8.7
Control	Sept 1982	6	7.3	4.5	8.0
2	Sept 1981	5	7.0	3.5	8.2
Zn Chelate	Sept 1982	5.5	7.8	5	7.9
3	Sept 1981	5.5	6.8	3.5	8.0
Zn Chelate	Sept 1982	6	7.4	6	7.7
4	Sept 1981	5	7.0	3.5	8.3
Zn Chelate	Sept 1982	5.5	7.8	5	7.9
5	Sept 1981	5	6.9	3.5	8.3
Zn Sulfate	Sept 1982	5.5	7.9	5.5	7.9
6	Sept 1981	5	6.9	3.5	8.3
Zn Sulfate	Sept 1982	5	7.8	5.5	7.8
7	Sept 1981	5	6.8	3.5	8.3
Zn Sulfate	Sept 1982	6	7.3	6.0	7.8

The effectiveness of the chelated and the sulfate forms seem to be similar.

No change in leaf zinc levels was detected in the young orchard where zinc levels were already adequate.

Increase in fruit yield as a result of zinc application could not be confirmed by statistical analysis. Yield variability within treatments was high and will have to be reduced to show any positive effect as a result of treatment (Table III).

No differences as a result of treatments could be detected in the fruit firmness (pressure test) or mature (starch-iodine test) as can be seen in Table IV.

In 1983, it will be essential to reduce tree to tree variability.

The level of zn was adequate (77 ppm in the control) in the control, no yield response to zn application is evident. The experiment will be continued for another two years to substantiate these preliminary conclusions.

REFERENCES: Stiles, Warren C. Department of Pomology, Cornell University, Ithaca, N.Y. Nutrient Sprays for Fruit Trees (personal communication).

Micro Nutrient in Ontario Fruit Production. The Grower, p. 24, May, 1981.

ACKNOWLEDGEMENT: The authors wish to express their appreciation to Mr. D. Jones and Mr. F. Everett for their cooperation and assistance in conducting this trial.

Thanks are also due to Niagara Chemical, Division of Reichhold Ltd., for supplying the zn-chelate source.

SUMMER PRUNING DEMONSTRATION*

BY

E. N. ESTABROOKS

Abstract: A summer pruning demonstration was carried out using commercial apple orchards in two locations with two cultivars at each site. The pruning demonstration was set up to illustrate how apple trees could be maintained within their allotted space through removal of vegetative growth in summer while retaining production of high quality fruit.

INTRODUCTION: Summer pruning has been practiced for centuries by European gardeners in order to restrict vegetative growth and to induce the formation of flowering spurs. Research on summer pruning conducted in the early 1900's produced widely differing results depending on type of pruning, tree vigor and cultivar.

Summer pruning generally refers to the detail cutting of current season's shoots throughout the tree to restrict vegetative growth and induce the formation of flower buds during July and August. Summer pruning in late July and early August usually produces less regrowth. Pinching is the usual term used for the removal of the tip of current season's shoots while heading is the term used to describe cutting current season's shoots back to 4 or 6 mature leaves. Stubbing usually refers to the cutting of upright shoots back to about 3/4 to 1 1/3 cm above the base, leaving a short stub.

Other benefits of summer pruning besides restricting vegetative growth and induction of flower buds include improved light penetration thus leading to improved fruit color and improved fruit calcium content (Bramlage and Drake, 1978).

In today's modern orchard with increased numbers of trees per hectare, the state of knowledge of combining rootstock with cultivar to soil and management is not adequate to end up with the perfect spacing. Thus, summer pruning can be a useful tool in the containment of fruit trees (Crowe, 1980).

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*Financially supported by Technology Transfer Program, A.S.A. II.

METHODS: The main purpose of this trial was to hold down tree vegetation and maintain trees easily in allotted space while retaining fruit colour.

The trial was set up as a 2 x 4 Factorial with comparisons between summer and winter pruning using four popular cultivar/rootstock combinations.

The trees selected for this trial were at two locations - St. Joseph and Keswick. At the St. Joseph location, Spur McIntosh on Antinovka rootstock planted in 1973 at 4.3 m by 6.7 m spacing and Vista Bella on M26 rootstock planted in 1975 at 2.4 m x 4.3 m were chosen. The Spur McIntosh/Antinovka trees had a spread of 4 m while the Vista Bella/M26 trees were using the full 2.4 m allotted in the row. The trees selected at Keswick were Spur McIntosh/M111 at 3 m by 5.5 m and Cortland/M7 planted in 1975 and spaced at 3.3 m by 6 m.

Three trees of each cultivar were selected for trial to compare summer pruning with winter pruning. Summer pruning was carried out during the last week of July and the first week of August, 1981 after terminal growth had ceased. In the summer pruning process, all terminals with more than 20 cm of new growth were headed leaving about 5 cm of new tissue containing 4 to 6 leaves.

The only dormant pruning which these summer pruned trees received was for structure improvement or repair of breakage. Dormant pruned trees are to receive no summer pruning.

Similar pruning treatments were applied again in 1982.

RESULTS: No obvious differences could be noted in the amount of bloom between summer pruned and winter pruned trees. However, it was noted that there was less bare wood in summer pruned Spur McIntosh/Antinovka trees. Also, some tip die back was noted in both the summer and winter pruned Vista Bella/M26 trees. The average tree canopy spread was greater in the winter pruned trees as can be seen in Table I.

TABLE I. AVERAGE TREE CANOPY SPREAD AFTER ONE YEAR SUMMER AND WINTER PRUNING - 1982.

Cultivar/Rootstock	Winter Pruned Diameter (m)	Summer Pruned Diameter (m)
Cortland/M7a	3.8	3.1
S.Mac/M111	3.5	3.5
Vista Bella/M26	3.0	2.7
S.Mac/Anti.	3.8	3.5
Ave.	3.5	3.2

No obvious differences in crop yield could be detected between the summer pruned and winter pruned trees in any of the four cultivar/rootstock combinations. The Vista Bella/M26 produced an estimated 30 kg/tree while the S.Mac/Antinovka produced yields of 73 kg/tree. Cortland/M7a produced 32 kg/tree while S.Mac/M111 yielded 55 kg/tree.

DISCUSSION: It was obvious from observation that there was a larger canopy on the winter pruned trees than where summer pruning had been carried out except with the Spur Mac/M111. In this situation, the summer pruned trees had been larger at the start of the trial. As the trial continues, this difference in tree size is expected to increase.

Yield difference could not be detected by estimating while on the tree. At the Keswick location, it was noted that the trees of both Spur MacIntosh and Cortland had suffered some winter injury (to the spurs in the Spur MacIntosh and to whole branches in the Cortlands). This injury may have masked any yield difference which might have existed. Differences in yield will not likely occur until at least the second or third year after initial treatments.

CONCLUSIONS: After one full year of trial, slight differences in size of tree canopy could be detected. No differences in fruit yield could be detected between the summer and winter pruned trees for any of the four cultivars.

REFERENCES: Bramlage, W. J. and Mack Drake. 1978. The Effect of Summer Pruning of McIntosh Apple Trees on the Calcium Nitrition and Postharvest Quality of the Apples. Fruit Notes. Vol. 43 #4. University of Mass. July/August 1978. p. 13.

Crowe, A. D. 1974. Effect of Time of Pruning on Performance of Red Delicious Apple Trees. Research Station. Annual Report. Kentville, N. S. p. 9-11.

Crowe, A. D. 1980. Dormant Versus Summer Scaffold Renewal Containment Pruning of Apples. Research Station. Annual Report. Kentville, N. S. p. 6-8.

Lord, W. J. and D. W. Greene. 1978. Apple Tree Response to Summer Pruning. Fruit Notes. Vol. 43 #4. Univ. of Mass. July/August, 1978. p. 8-12.

GROWTH REGULATOR TREATMENT OF YOUNG APPLE TREES TO INDUCE FRUITING*

BY

E. N. ESTABROOKS

Abstract: Alar and alar plus ethrel have been applied to induce flowers in young apple trees slow to produce fruit. Growth regulator treatments were compared to scoring as a means to increase flower bud formation. High rates of alar alone or with Ethrel induced better bloom and significantly higher yields in McIntosh. Scoring treatment induced significantly higher yields in the Red Delicious cultivars.

INTRODUCTION: Most new apple orchards are of cultivars and rootstocks which tend to produce a crop of fruit within a few years after planting. However, occasionally some blocks of apples are slow to produce bloom and set a crop. Such an occurance can be discouraging to growers and jeopardize early profitability. Growth regulators daminozide (Alar) and Alar plus ethephon (Ethrel) have been used to reduce vegetative growth and induce flowering. The timing and conditions of growth at time of treatment have proven to be most critical for effective and reliable results (Greene and Lord 1979). There is a need to refine the use of growth regulators for inducing flower bud formation so that growth regulations may become another effective tool in making new orchards profitable. This is the final report on growth regulator treatments to induce fruiting in young trees.

METHODS: A block of 7 year old McIntosh and Red Delicious apple trees which have produced only light crops to date and with little bloom in 1981 were treated with two levels of Alar and two levels of Alar plus Ethrel. Treatments were applied 10 days after petal fall (June 11, 1981 for McIntosh and June 16 for Red Delicious) when new terminal growth was about 12 to 15 cm. Scoring treatments were applied on the same day as the chemical treatments in accordance with the cultivar. Treatments were applied to randomized individual trees as a dilute spray and were replicated five times.

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*Financially supported by Technology Transfer Program, A.S.A. II.

RESULTS: In 1981, McIntosh trees treated with Alar 4 kg/ha plus Ethrel .7 l/ha had the average terminal growth reduced by 45% compared to the check trees. For Red Delicious that same treatment reduced terminal growth by 53% from that of the check. With some growth regulator treatments, little new terminal growth occurred after treatment. The scoring treatment generally reduced terminal growth less than the growth regulator treatments but did result in reduced growth of 32% for both McIntosh and Red Delicious. Scoring produced pale colored leaves.

The number of flower buds recorded in the spring of 1982 for the various treatments were variable but generally showed more bloom than the check. The scoring treatment with McIntosh showed 50% more bloom than the check. With Red Delicious, all treatments except the low rate of Alar gave double the amount of bloom found on the check trees.

Table 1. Effect of Growth Regulator and Scoring Treatments On Yields of Young McIntosh and Red Delicious Apple Trees - 1982

	MCINTOSH	RED DELICIOUS
Treatment	Average Yield Per Tree (KG)	Average Yield Per Tree (KG)
Alar 6 kg/ha	78.0 a*	19.0 ab*
Alar 4 kg/ha + Ethrel .7 l/ha	76.0 a	20.9 ab
Alar 2 kg/ha + Ethrel .7 l/ha	59.7 ab	17.2 ab
Scoring	56.1 ab	26.3 a
Alar 3 kg/ha	54.3 ab	10.4 b
Check	42.5 b	14.9 ab

*Means followed by like letters are not significantly different at the 5% level of the NDMRT.

DISCUSSION: With McIntosh, the high level of Alar and the high Alar plus Ethrel produced nearly 60% more fruit than the check trees. Other yield differences between other treatments have not shown up as being significantly different. Yield variability between trees within any treatment was found to be great including the check. This variability in yields between young starting-to-bear trees has been commonly observed in other orchards in New Brunswick.

Growth regulator treatments with the proven higher rates of Alar or Alar plus Ethrel should be used in commercial orchard blocks which are slow to come into bearing. Also treatments with lower rates of Alar and Alar plus Ethrel should be tried in larger treatment areas. Yield difference between the two cultivars can be explained by the increased number and size of fruit with McIntosh compared to the Red Delicious.

SUMMARY: Growth regulators Alar and Ethrel had an suppressing effect on the amount of vegetative growth produced by young McIntosh and Red Delicious apple trees treated ten days after petal fall when terminal growth was 12 to 15 cm. Scoring also reduced vegetative growth. Production of McIntosh fruit was significantly higher where the high rate of Alar was used alone or with Ethrel than with the check. For Red Delicious, the scoring treatment was significantly better than the check.

REFERENCE: Greene, Duane and W. T. Lord. 1979. Growth Regulator Spray for Growth Suppression on Apple Trees. Fruit Notes. Vol. 44 #3. Univ. of Mass. May/June, 1979. p. 11.

REGIONAL APPLE DEMONSTRATIONS

BY

E. N. ESTABROOKS AND G. W. REED

Abstract: Five regional apple demonstrations were established in New Brunswick from 1975 to 1979 to evaluate selected cultivars and rootstocks at several different tree spacings. Records of tree growth and fruit yield have been taken. Limited data to date indicate that Cortland/M111 was the best yielding combination in trial. Cortland/M26, S. McIntosh/M111 and S. McIntosh/M7 generally produced a good yield.

INTRODUCTION: At the request of the apple industry, five regional demonstration apple orchards were established in the main apple production regions of the Province so that growers could have local information on cultivar and rootstock performance on various soils and at various spacing. Because of the large number of possible cultivars, rootstocks and possible spacing, it was necessary to select four popular cultivars on five promising size controlling rootstocks at three tree densities. The local demonstrations were to serve as a place to try out new cultural practices.

METHODS: Apple orchards of about 1 ha in size containing similar cultivars, rootstocks and at similar spacing were established on grower farms in the five main apple growning regions of the Province between 1975 and 1979. Not all sites nor all cultivar - rootstock combinations were established in one year. Trees were planted out over five years as desirable cultivar - rootstocks became available. Seven trees per cultivar - rootstock combination were planted and replicated at three spacing within each site.

Care and maintenance for the demonstrations were provided jointly by co-operative growers and N. B. Department of Agriculture personnel according to a responsibility plan agreed to at the start of the project.

RESULTS: Yield results from the individual demonstrations have been summarized as follows:

Westmorland-Kent Regional Apple Demonstration: Fruit was produced on some cultivar-rootstock combinations in 1979 with a heavier crop being produced on more plots in 1980. In 1981, yields were low due to spring frost. Yields in 1982 were generally good.

As can be seen in Table I, heaviest production was obtained from Cortland/M111 where the equivalence of 300 bushel/acre was produced at a tree density of 155 trees/acre. Good yields were also obtained with Cortland/M7, Cortland/M106 and Cortland/M26.

Spur McIntosh/M111 produced a good yield and the equivalence of 280 bushels/acre (180 trees/acre). McIntosh/M26 produced 14.1 kg/tree which represents 250 bushels/acre (242 trees/acre). McIntosh/M7 produced a light crop in 1982. Yields from Red Delicious on M26 and M106 were light.

Queens-Sunbury Regional Apple Demonstration: During the 1979 winter, this regional orchard suffered extensively from winter injury similar to some commercial orchards in the area. About 40% of the planting was lost. Records of winter injury were taken in 1980. Little crop was harvested in 1981. Yields were recorded in 1982, but will not be reproduced here.

York Regional Apple Demonstration: The first small crop of apples was harvested in 1980. Damage caused by deer to terminal growth and fruit reduced the crop that year.

Table II shows the fruit production harvested from the demonstration orchard in 1982 as well as accumulated yields. Cortland/M111 was the heaviest producing combination. Cortland/M7, although fairly productive, showed some winter injury and leaning of trees. Spur McIntosh/M111 produced fairly high yields as did S. McIntosh/M26. Low yields were recorded for McIntosh on M111 and M7 rootstocks.

Carleton Regional Apple Demonstration: The first fruit was harvested from this orchard in 1979 from trees planted in 1976. Jerseymac and Spur McIntosh were the first to start production. In 1980, a larger number of fruits were produced. On June 27, 1980, a major hailstorm destroyed the crop in the demonstration orchard along with that in neighboring commercial orchards. No record of crop was taken in 1980. A crop was harvested from the demonstration in 1981 despite heavy deer and cattle damage in some plots. Yields were recorded in 1982 but will not be reproduced here due to incompleteness of plots. A number of plots have not recovered from the livestock damage.

Charlotte Regional Apple Demonstration: The first apples were produced in this orchard in 1980 from trees established in 1976. In 1982, the most productive cultivars were Cortland/M111 and Cortland/M7 (Table III). Good yield was also recorded for Cortland/M26. Spur McIntosh/M106 and Spur McIntosh/M7 also produced fairly good yields. McIntosh/M106 was the heaviest bearer among the McIntosh on various rootstocks in the planting. Some winter injury was observed for Cortland, S. McIntosh and McIntosh on M7. Slight winter injury was also noted in S. McIntosh/M111, S. McIntosh/M106, S. McIntosh/M26 and in McIntosh/M26.

SUMMARY AND CONCLUSIONS: Most regional demonstration orchards are now producing fruit and the cultivar Cortland on rootstock M111 has been the heaviest bearing trees during the first few years of production. Spur McIntosh particularly with rootstocks M111 and M7 have produced heavier early yields than McIntosh on similar rootstock, except possibly for McIntosh/M26 where yields are comparable.

Data on yield and tree growth obtained from these regional demonstrations during the next few years should assist fruit growers in their apple cultivar-rootstock selection and tree spacing.

REFERENCES: A. D. Crowe. 1973. Stocks for Apples. Atlantic Hort. Comm. AHC-2.

A. D. Crowe. 1976. Apple Scion Varieties and Strains. Atlantic Hort. Comm. AHC-5.

A. D. Crowe and L. Lyons, 1978. Comparison of Stocks and Spur Types in McIntosh Apple With Selected Training Systems and Tree Spacings. Agriculture Canada Research Station, Kentville, Nova Scotia. Annual Report. pg. 8.

A. Hutchinson. 1974. Rootstocks for Fruit Trees. Pub. 334. Ontario Ministry of Agriculture and Food.

TABLE I. FRUIT PRODUCTION FROM WESTMORLAND-KENT REGIONAL APPLE DEMONSTRATION

Cultivar/ Rootstock	1982 Average Fruit Yield (kg/tree)	Accumulated 1979-82 (kg/tree)	General Comments
Cortland/M111	36.9	42.2	Good yield, tree spread 4 m
Cortland/M106	15.6	20.7	Tree spread 2.7 m
Cortland/M7	14.5	22.1	Good crop, tree spread 3 m
Cortland/M26	14.3	21.7	Good crop, tree spread 2.1 m
Cortland/I/M111	5.0	6.1	Tree spread 2.4 m
Spur McIntosh/M111	19.1	25.4	Good yield, tree spread 3 m
Spur McIntosh/M106	14.1	16.7	Tree spread 3 m
Spur McIntosh/M7	12.5	16.5	Tree spread 2.7 m
Spur McIntosh/M26	3.6	7.6	Tree spread 1.8 m
McIntosh/M26	14.1	23.3	Good yield, tree spread 2.7 m
McIntosh/M106	10.7	13.0	Tree spread 2.7 m
McIntosh/M111	4.4	5.4	Light crop, tree spread 2.7 m
McIntosh/M7	3.8	4.5	Light crop, tree spread 2.4 m
R. Del./M26	4.5	7.1	Fruit size fair, tree spread 1.8 m
R. Del./M106	1.9	4.3	Fruit size small, tree spread

TABLE II. FRUIT PRODUCTION FROM YORK REGIONAL APPLE DEMONSTRATION

Cultivar/ Rootstock	1982 Average Fruit Yield (kg/tree)	Accumulated 1979-82 (kg/tree)	General Comments
Cortland/M111	21.0	38.7	Good yield, tree spread 3.3 m
Cortland/M7	11.7	20.9	Winter injury and leaning, tree spread 2.7 m
Cortland/M106	11.0	20.6	Tree spread 3.3 m
Cortland/M26	4.5	28.8	Tree spread 2.1 m
Spur McIntosh/M111	16.2	27.6	Fair yield, tree spread 3 m
Spur McIntosh/M7	10.1	33.2	Tree spread 2.7 m
Spur McIntosh/M26	9.8	27.5	Good yield, tree spread 2.4 m
Spur McIntosh/M106	6.5	17.9	Tree spread 3 m
McIntosh/M26	13.1	23.3	Winter injury, tree spread 2.7 m
McIntosh/M106	10.3	18.3	Tree spread 2.4 m
McIntosh/M111	5.1	8.0	Low yield
McIntosh/M7	4.2	19.4	Low yield, winter injury
Jersey Mac/M7	7.5	7.5	Tree spread 3 m

TABLE III. FRUIT PRODUCTION FROM CHARLOTTE REGIONAL APPLE DEMONSTRATION

Cultivar/ Rootstock	1982 Average Fruit Yield (kg/tree)	Accumulated 1979-82 (kg/tree)	General Comments
Cortland/M111	29.0	30.3	Good yield, tree spread 3.6 m
Cortland/M7	26.9	29.9	Good yield, winter injury, tree spread 3.3 m
Cortland/M26	16.7	17.9	Good yield, tree spread 2.4 m
Cortland/M106	15.6	16.8	Tree spread 2.7 m
Spur McIntosh/M106	15.1	15.3	Tree spread 2.7 m, winter injury
Spur McIntosh/M7	13.0	13.6	Tree spread 2.1 m
Spur McIntosh/M26	6.2	6.8	Tree spread 1.8 m
Spur McIntosh/M111	3.9	3.9	Low yield, tree spread 2.4 m
McIntosh/M106	13.1	13.2	Fair yield
McIntosh/M7	8.6	8.6	Tree spread 2.7 m, winter injury
McIntosh/M111	6.0	6.0	Tree spread 2.4 m
McIntosh/M26	5.2	5.3	Tree spread 1.8 m

EVALUATION AND DEMONSTRATION OF A MISTBLOWER FOR USE IN LOWBUSH BLUEBERRY FIELDS 1982*

BY

S. MICHAUD, G.W. WOOD AND K. LYNCH

Abstract: This is the continuation of a project initiated in 1981 to evaluate the Automatic Mist Blower in blueberry fields for application of insecticides and fungicides.

INTRODUCTION: After proving to be very satisfactory in the application of insecticides for maggot control in blueberry fields in 1981, it was decided to evaluate the mist blower for fungicide application and other insect control work.

The Automatic Mist Blower uses air as a carrier. A Centrifugal blower creates a high-powered blast of air. Droplets created by a Beecomist Spray Head (equipped with a 80 micron stainless steel perforated sleeve) are sent into the air blast and a high speed cloud of droplets is created. Because the spray mixture is broken down into finer droplets than would be obtained from conventional sprayers, more coverage is obtained with less active ingredients and less water is used.

The equipment is mounted on the three-point hitch of the tractor. It is equipped with a hydraulic volute which allows the operator to control the elevation and direction of the spray.

METHODS: All materials were applied twice in 0.8 ha plots using the Automatic Mist Blower sprayer. Materials were applied in water under 275 KPa pressure and delivered at a volume of approximately 22 L/ha.

Three fungicides were used, Benlate 50 W.P. (.75 kg/ha a.i.), Captan 50 W.P. (.56 kg/ha a.i.) and Ferbam 76 W.P. (1.5 kg/ha a.i.). The first application was made on May 18 and the second on May 27. However, due to the dry warm weather experienced during bloom, no blight was found either in the control plot or in the spray plots.

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*Financially supported by Technology Transfer Program, A.S.A. II.

Three insecticides were used: Cygon 4E (dimethoate) Guthion L (axinphos-methyl) and Imidan 50 W(Phosmet). The first application was made on July 14 and the second on July 28. Blueberry samples were taken at random from each plot on August 4.

RESULTS AND DISCUSSION: Results are given in Table 1. They are based on maggot counts in 5 one-litre berry samples taken randomly from each treated plot and a control at harvest time. From the results obtained, it is evident that the degree of control was very good and there was adequate coverage of the field with insecticide.

Table 1 Effect of Application, Using an Automatic Mist Blower of Five Different Insecticides For Blueberry Maggot Control in Lowbush Blueberry Fields in 1982 in New Brunswick

Treatment	Rate Kg ai/ha	Mean maggot count per litre (5 reps)
Guthion L	0.33	1.0
Cygon 4E	0.33	0
Cygon 4E	0.24	0
Cygon 4E	0.16	1.2
Imidan 50w	1.0	0.8
Control		38.6

The mist blower was also used for the control of a heavy infestation of leaf tier and the grower involved was very satisfied with the control obtained. The machine was also used in Charlotte Co. to help with the tent caterpillar problem. The hydraulic volute turned out to be an asset in this case since it allowed growers to spray the vicinity of the blueberry fields to stop the insects from moving in the field.

Because the aerial spraying was not available this summer, it was impossible to compare the mist blower to spraying by plane as far as coverage and spray distribution. It is hoped this can be done next year.

CONCLUSIONS: This piece of equipment proved that it can apply both fungicides and insecticides effectively. It was demonstrated to growers in the province throughout the province and some are planning on buying one for their own use and in some cases to do custom work.

REFERENCE: Michaud S.G. and G.W. Wood, 1981. Evaluation and demonstration of a mist blower for use in lowbush blueberry fields. 1981 Adaptive Research Report, New Brunswick Agriculture, p. 12-14.

TRICKLE IRRIGATION AND MULCHING OF MID HIGHBUSH CULTIVATED BLUEBERRIES*

BY

S.G. MICHAUD AND B.W. DYKEMAN

Abstract: A study was initiated in 1980 at the New Brunswick Horticultural Centre, Hoyt, to evaluate the effect of mulching and irrigation on the growth and development of mid-highbush.

INTRODUCTION: This is a replicated study which was undertaken to determine the extent to which cultivated blueberries respond to irrigation and mulch under New Brunswick conditions. The first data collected is given in this progress report.

METHODS: Complete details of this study are given in the 1980 Adaptive Research Report (Dykeman, 1980). For 1982, irrigation was applied as required. Blueberries were harvested on August 14, August 19 and August 30. These mid-highbush blueberries have fruiting habits similar to highbush and can be picked annually. Total average yield is presented in Table 1.

Table 1 - Harvest data on the effect of irrigation and mulch on yields (g) in mid-highbush blueberries in 1982, Hoyt, N.B.

Treatment	Yield (g)
No mulch, no irrigation	1098.2
Mulch, no irrigation	815.5
No mulch, irrigation	782.4
Mulch + irrigation	817.6

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*Financially supported by Technology Transfer Program, A.S.A. II

DISCUSSION: Observations throughout the 1981 and 1982 growing seasons showed that the plants that were mulched and/or irrigated have put on more vegetative growth. Even though no fruit bud counts were taken, the amount of blooms was lighter on the irrigation and mulched trials. In 1982, mulch and irrigation, whether combined or used separately, did not give better yields than where no mulch and irrigation was used. This is the first time this trial is harvested and the plants have, during the two past years, gone through an establishment period. Therefore, it is hard to derive any definite conclusions out of this trial, which will be carried out for at least four more years.

This trial will be harvested again in 1983.

CULTIVATED LOWBUSH BLUEBERRY CROP SCHEDULING STUDY*

BY

S. MICHAUD AND B. W. DYKEMAN

Abstract: The project initiated in 1980 to determine the optimum crop scheduling system for cultivated lowbush blueberries was continued. Yield data is reported.

INTRODUCTION: This study was started in 1980 with two specific objectives: 1) To determine the ability of select clones to fruit economically two years or more before pruning; and 2) To determine the optimum scheduling system for cultivated lowbush clones.

The study was carried out according to the proposed harvesting schedule drawn up in 1980 and two of the four treatments were harvested in 1982.

METHODS: According to the harvesting schedule (Dykeman, 1980), treatments #1 and #3 were pruned in the spring of 1982. Older wood was removed by hand in treatment #4. Treatments #2 and #4 were harvested when 90% of the blueberries were ripe.

RESULTS AND DISCUSSION: Table I gives the results of 1980, 1981 and 1982 data. Here again, Chignecto proved to give high yields when pruned. The other clones also had good yields, but since they tend to be more vigorous and produce more vegetative growth, yields were considerably lower than Chignecto.

Treatment #4, selective pruning, showed a drop in yield for four of the five clones. But even with the drop in yields, this alternative is still interesting when yields are considered in relation to the economics of the total operation. However, to do selective pruning on a large acreage is not very practical.

Yields in treatment #2 are as good or better than 1980. This can be expected since the plants are still spreading and increasing in size.

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*Financially supported by Technology Transfer Program, ASA II.

REFERENCES: Dykeman, B. W. and S. G. Michaud. 1980. Cultivated Lowbush Blueberry Crop Scheduling Study, Adaptive Research Report, Plant Industry Branch, New Brunswick Department of Agriculture and Rural Development. p. 49-52.

Dykeman, B. W. and S. G. Michaud. 1981. Cultivated Lowbush Blueberry Crop Scheduling Study, Adaptive Research Report, Plant Industry Branch, New Brunswick Department of Agriculture and Rural Development. p. 41-42.

TABLE I. HARVEST DATA FROM THREE CROPPING SYSTEMS FOR CULTIVATED LOWBUSH BLUEBERRY

Clone	System*	Yield (1980) kg/ha	Yield (1981) kg/ha	Yield (1982) kg/ha
Chignecto	1	-	9,182	-
	2	4,136	-	7,762
	3	3,548	2,625	-
	4	5,519	9,636	9,439
74-8	1	-	1,997	-
	2	3,920	-	1,992
	3	3,489	2,439	-
	4	3,749	2,153	1,537
206	1	-	938	-
	2	835	-	832
	3	795	2,600	-
	4	1,277	2,686	1,097
74-7	1	-	1,353	-
	2	685	-	2,664
	3	974	2,382	-
	4	1,927	1,369	1,419
74-14	1	-	689	-
	2	548	-	1,431
	3	599	1,026	-
	4	534	1,700	542

*System:

1. Biennial Prune #1
2. Biennial Prune #2
3. Triennial Prune
4. Selective Prune

CULTIVATED LOWBUSH BLUEBERRY DEMONSTRATION*

BY

S.G. MICHAUD

Abstract: Six cultivated lowbush blueberry demonstrations were established across the province between 1976 to 1978. Information on management practices and performance of the plantations are given in this progress report.

INTRODUCTION: The six cultivated lowbush blueberry demonstrations are now providing information on management practices to be used by producers. Valuable information on performance of individual clones and seedlings is also being collected and analyzed.

OBSERVATIONS: Growth in the 1981 season was good and the amount of fruit buds was above average in most of the plantings. No loss due to winter injury or heaving was experienced. Even though a delay in shoot emergence and growth was noticed at the two sites where mulch was applied, the mulched section still yielded heavily. (Table II).

Table 1 - Yield data from 1977 and 1978 plantings, second year fruiting

1977 Planting		Yield kg/ha
Clone	206	2330
	Me2 O.P.	3670
	Me451xMe2	4670
	74-19	2170
	Me4161X698	1670
	Me2X508	4000
	Me4161 O.P.	2000
	Me2X325	3000
	907XMe2	1670
1978 Planting		
Mixed Seedlings		5300

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*Financially supported by Technology Transfer, ASA II

Table 2 - Yield data from 1978 plantings, first year fruiting

		Yield (kg/ha)
Clone	206	875
	Me2 O.P.	1130
	Me451XMe2	4830
	74-19	250
	Me2X508	2500
	041	1670
	877	1790
	Me4161 O.P.	2670
	Me4161X698	833
Mixed seedling (mulched)		4400

The same clones were harvested at plantings throughout the province, and an average yield is presented in Table 1 and 2. A section of 6 m was harvested for each clone. Yield is given in kg/ha.

From the data presented in Table 1, it is obvious that the cultivated lowbush blueberries can give high yields even when fruited for two consecutive years. This had been noticed previously in crop scheduling studies and presents advantages for the grower who will not have to prune every second year. No major disease or insect problem was encountered in the second crop plantings. It might even be possible to look at three harvests before pruning once the plantings are fully established. This gives a totally new outlook to the economics of cultivated lowbush blueberries.

Program for 1983

Three plantings will be pruned (flail mower and oil burner). Two newly registered herbicides for blueberries will be tested on the burnt sites. With the completion of the ASA II program, these plantings will be turned over to growers. Data will still be collected since this is a new crop and a lot more information has to be gathered to ensure its viability.

SUMMARY: These demonstration plantings have given a lot of information on getting cultivated lowbush blueberries established on a commercial scale. However, even though many problems have been resolved, there still remains a great deal of questions on the management aspect of the plantings. The aspect of clone adaptation to different areas is only one of the many concerns that still have to be looked into. There is no doubt any more that cultivated lowbush blueberries are feasible. Refining the system and improving it in terms of cultural practices, management, selection of plant material and other factors is needed to ensure the development of this new crop.

PENNFIELD NATIVE BLUEBERRY IMPROVEMENT PROJECT

BY

S.G. MICHAUD AND E. N. ESTABROOKS

Abstract: An evaluation was established in the Pennfield area of Charlotte County to evaluate the effect of cultural practices on lowbush blueberry production in an area where yields have been gradually declining over the past 20 years.

INTRODUCTION: This project was initiated in 1980 to evaluate the effects of mulch and fertility. The first yields were obtained in 1981 and showed that only the use of the sawdust mulch gave significantly higher yields over woodchip mulch or no mulch. The use of fertilizer did not have any significant effect on yields at that time.

METHOD: In 1982 the site was burned on May 22, pruned with a flail mower on May 25. Velpar was applied at 2 kg/ha on May 29. No other cultural practices were carried on at the site.

OBSERVATIONS: Some of the woodchip mulch caught fire while burning and caused some shoot emergence delay. No problem was encountered with the sawdust mulch which retained more moisture than the woodchips.

Shoot growth was good overall with new shoots still emerging from the woodchip mulch. The trial will be harvested in 1983.

REFERENCES: Michaud, S.G. and E.N. Estabrooks, 1981 Pennefield Native Blueberry Improvement Project, Adaptive Research Report, Plant Industry Branch, New Brunswick Department of Agriculture and Rural Development. p. 15-17.

BLUEBERRY CLONE EVALUATIONS*

BY

B. W. DYKEMAN AND S. G. MICHAUD

Abstract: A continuing program of evaluating blueberry clones for their suitability to New Brunswick conditions is reported. In 1980 and 1981, records on bloom dates, winter injury and fruit characteristics were kept.

INTRODUCTION: Each year, over sixty clones of lowbush and half-highbush blueberries which are grown at the New Brunswick Horticultural Center are evaluated for growth habits which will affect their adaptability to New Brunswick. These evaluations are not replicated trials but simply observations which will be made over a number of years.

Characteristics which are important to New Brunswick are the bloom dates and winter hardiness, as well as productivity and fruit quality. The lowbush blueberry is a plant which blooms while the chance of spring frosts is still high throughout much of New Brunswick. Therefore, in the selection of suitable clones, late blooming types are of real value. Also, winter hardiness is a characteristic which varies among clones and one which is of major importance in selection for New Brunswick production.

RESULTS: Table I gives some of the results of the 1982 observations. A light frost in mid-May and a serious tent caterpillar infestation affected the plants before and during the bloom period. Fifty percent bloom ranged from May 26 to May 31.

All clones came through the 1981-82 winter with little or nor dieback or fruit bud injury.

Fruit weights are presented in Table I. No flavour rating was carried out because different individuals were doing the harvesting.

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*Financially supported by Technology Transfer Program, ASA II.

TABLE I. BLOOM AND FRUITING OBSERVATIONS ON SELECTED BLUEBERRY CLONES, 1982

Clone	Date of 50% Bloom	Spread in Bloom Period	100 Berry Wt. (g)
72-3	May 31	6	67.8
75-9	May 28	5	54.6
633	May 28	5	69.1
705	May 28	5	56.9
685	May 26	5	44.3
Me3	May 27	6	55.5
671	May 28	6	59.8
Chignecto	May 27	6	40.9
510	May 27	6	48.6
70-62	May 27	6	70.5
4161	May 27	5	54.7
72-2	May 28	5	53.5
315	May 26	6	54.6
70-60	May 27	6	92.0
70-36	May 27	6	50.9
678	May 27	5	78.1
206	May 27	6	44.1
Augusta	May 27	5	85.1
758	May 26	6	74.3
799	May 27	6	55.6
69-1	May 28	5	78.9
907	May 27	6	65.6
662	May 27	5	29.5
686	May 27	5	35.9
70-85	May 26	5	61.6
Brunswick	May 27	6	71.8

REFERENCES: Dykeman, B. W. 1976. Blueberry Clone & Seedling Evaluations. 1976 Research Report. New Brunswick Agriculture.

Dykeman, B. W. 1977. Blueberry Clone & Seedling Evaluation Program. 1977 Research Report. New Brunswick Agriculture.

Dykeman, B. W. 1980. Blueberry Clone Evaluations. 1980 Adaptive Research Report. New Brunswick Agriculture. p. 45-48.

Dykeman, B. W. 1981. Blueberry Clone Evaluations. 1981 Adaptive Research Report. New Brunswick Agriculture. p. 40-41.

THE USE OF ATRAZINE FOR HERBACEOUS WEED CONTROL IN LOWBUSH BLUEBERRIES*

BY

D. J. DOOHAN

Abstract: Atrazine effectively controlled a wide range of herbaceous species in lowbush blueberries and was registered for this use in early 1982.

INTRODUCTION: Atrazine has been established since the early 1960's as a major herbicide in corn production. In this crop, low rates of atrazine, that is 1 to 2 1/2 kg per hectare, safely and effectively controls many germinating seedling weeds. Like corn, the native lowbush blueberry has also been shown to be highly tolerant to atrazine. In blueberries, however, established perennial weeds predominate but many of the more common ones can be controlled by relatively high rates of atrazine while still maintaining a wide margin of safety to the crop.

RESULTS AND DISCUSSION: The response of some common weeds to 4.5 to 8.0 kg/ha atrazine is listed in Table 1. Atrazine will control most common sedges and grasses, except Panicum boreale. In addition, atrazine will also control some of the goldenrods and asters, hawkweeds and cinquefoils. Because of its activity against these broadleaved weeds, atrazine can generally be expected to give superior weed control in most situations than terbacil (Sinbar). Atrazine will also prevent the establishment of many weed species from seed. Atrazine is not known to control any of the common woody weeds associated with blueberries, such as lambkill, hardhack, trailing blackberry, etc. (Table 1). Because of its herbicidal activity, it is recommended that atrazine be used in situations that are relatively free of woody species, but may be infested with a mixture of grasses and herbaceous broadleaved weeds.

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*Partially funded by Technology Transfer Program, A.S.A. II.

On medium textured soils, there is a wide (2x) margin of safety to the crop if atrazine is applied soon after the burn but before the blueberry shoots emerge. Applications made after emergence may adversely affect the crop. Differential tolerance of lowbush blueberry clones has been shown with some of the other blueberry herbicides, but this does not appear to be a problem with atrazine. Blueberries respond well to the reduced weed competition and yields from atrazine treated research plots have shown significant yield increases.

Table 1. Response of some common weeds to 4.5 to 8.0 kg atrazine

Weeds Controlled	Weeds Not Controlled
Grasses	Grasses
Browntop	*Panicum boreale*
Poverty oatgrass	
Sheep fescue	
Bluegrass	
Timothy	
Broadleaf weeds	Broadleaf weeds
Narrow-leaved goldenrod	Vetch
Canada goldenrod	Bunchberry
White goldenrod	
One-sided aster	
Tall white aster	
Cinquefoil	
Hawkweeds	
Bugle weed	
Woody weeds	Woody weeds
None	Sweet fern
	Trailing blackberry
	Lambkill
	Wild rose
	Chokeberry
	Hardback
Others	Others
Sedges	Braken fern
	Hay-scented fern
	Rushes

CONCLUSIONS AND RECOMMENDATIONS: Lower rates (4 1/2 - 6 kg/ha) should be applied to light, sandy soils or when the weed population is low. Higher rates should be applied to heavier textured soils. Avoid applying atrazine to coarse, textured soils low in organic matter, or to rocky or uneven terrain that does not permit accurate application or on areas that are wet or poorly drained. Steep terrain that may be subject to erosion following control of weedy vegetation should not be treated.

Only the Aatrex Liquid (500 g active/L) formulation of atrazine has been registered by the manufacturer for use in lowbush blueberries. This formulation is easier to get into and maintain in suspension in the sprayer tank than wettable powder formulations. When using the Aatrex Liquid formulation it is important to use nozzle screens not finer than 50 mesh size. Furthermore, the bypass line should be kept at or near the bottom of the tank to minimize foaming. Apply the herbicide at 200 kPa pressure and use a spray volume of 200 to 350 L water per hectare.

HEXAZINONE - A NEW HERBICIDE FOR LOWBUSH BLUEBERRIES*

BY

D.J. DOOHAN

Abstract: Hexazinone (manufactured by DuPont Canada Ltd and marketed under the tradename VELPAR) was registered in April 1982 for control of grass and herbaceous weeds and several woody weeds in lowbush blueberries.

INTRODUCTION: Hexazinone is a broadspectrum herbicide that has recently been registered for use in native lowbush blueberries. Hexazinone is the most effective, selective herbicide that can be used in blueberries and at 1.5 to 2.0 kg (active) per hectare it will control both herbaceous and woody weeds. It is particularly useful in areas where the major weed problem is woody weeds. Although hexazinone is selective in lowbush blueberries, there is a relatively narrow margin of crop safety and a number of precautions must be observed in order to prevent excessive crop injury when using this herbicide.

RESULTS AND DISCUSSION: Hexazinone at 1.5 to 2.0 kg/ha controls all the common grasses and most of the herbaceous broadleaved weed species associated with blueberry production in Atlantic Canada (Table 1). Amongst the latter are included the goldenrods, asters, hawkweeds, yarrow, sheep sorrel, cinquefoils, etc. In addition, 1.5 to 2.0 kg/ha will also control such important woody weeds as lambkill, rhodora, hardhack and trailing blackberry. Some suppression of wild rose, bayberry and sweet-fern has also been observed, but consistent control of these species requires higher rates of hexazinone. Because of the increasing risk of crop injury with rates above 2.0 kg/ha, control of these species is not recommended with this product. Table 1 also lists species that are not controlled by hexazinone.

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*Partially funded by Technology Transfer Program, A.S.A. II.

Crop tolerance is limited with hexazinone, but by taking into account the following details this herbicide can be used safely and effectively in blueberries. Application of hexazinone is recommended only after the burn, but before the new blueberry shoots emerge. Selectivity is greatly reduced, or lost, if applications are made after emergence. Hexazinone applied after blueberries have "leafed out" will cause defoliation and severe injury. In most cases, defoliation of the lower blueberry leaves is generally observed following preemergence applications of 1 1/2 to 2.0 kg/ha hexazinone, but plants recover without detrimental effects on yields. It is only the lowbush blueberry (*Vaccinium angustifolium*) that is tolerant to hexazinone; Canada blueberry (*Vaccinium myrtilloides*) is not tolerant and will be killed. In addition, greenhouse tests have shown a small percentage of lowbush blueberry clones to be sensitive to hexazinone, and this may also be manifested under field conditions. However, widespread field testing has shown that when used at 1.5 to 2.0 kg/ha on suitable soil types and terrain, hexazinone gives excellent weed control which in turn results in an increase in blueberry plant stand and yield.

Table 1. Response of some common weeds to 1.5 to 2.0 kg/ha hexazinone.

Weeds Controlled	Weeds Not Controlled
Grasses	Grasses
Browntop	None
Poverty oatgrass	
Sheep fescue	
Bluegrass	
Timothy	
Panicum boreale	
Broadleaf weeds	Broadleaf weeds
Goldenrods	Bugleweed
Asters	Vetch
Yarrow	
Hawkweeds	
Pearly everlasting	
Cinque foils	
Wild strawberry	
Fireweed	

Daisies
Black medic
Yellow rattle

Woody weeds

Trailing blackberry
Poplar
Wild raspberry
Lambkill
Hardhack
Rhodora
Birches (control may be inconsistent)

Woody weeds

Willows
Conifers
Labrador tea
Bayberry
Choke pear
Wild rose
Red maple
Bunchberry

CONCLUSIONS AND RECOMMENDATIONS: Hexazinone should be applied in the spring after the pruning burn but before emergence of the blueberries. Fall applications are not effective. Hexazinone should not be applied on extremely sandy, or gravelly soil types, or to areas that are wet and poorly drained. It should not be applied to fields where the terrain does not permit even and accurate application. Furthermore, fields that may be subject to erosion in the absence of a suitable ground cover should not be treated. Hexazinone is extremely water-soluble and it may redistribute in depressions or at the bottom of slopes if heavy rainfall occurs shortly after application.

Hexazinone is particularly suitable for fields infested with woody species, or to sites that are being cleaned-up and brought into production. If herbaceous weeds predominate and woody weeds are sparse, atrazine at 6 to 8 kg/ha will give adequate and longer lasting control of many species.

RELATIVE EFFECTIVENESS OF SEVERAL FUNGICIDES IN CONTROLLING BLUEBERRY LEAF RUST

BY

KELVIN LYNCH

Abstract: Good control of leaf rust was achieved with four applications of CGA64250 or Bayleton 50 WP. Preliminary observations based on the effectiveness of the various spray treatments indicates that the infection period for leaf rust falls in the months of July and August in Southwestern New Brunswick.

INTRODUCTION: Blueberry leaf rust although not a serious problem in commercial production occurs annually at the New Brunswick Horticultural Centre where select clone plants are propagated. Infection rates often reach 100% and cause premature defoliation of plants. The occurance of this disease in a propagation nursery raises additional concerns about disease dissemination and makes the various disease management fungicides worth evaluating.

MATERIALS AND METHODS: One year old select clone (No. 508) blueberry plants were used in this evaluation. These plants were grown in peat rolls containing 35 plants and with 50 rolls located on each wooden pallet. One such pallet (approximately 1800 plants) served as the experimental unit for each treatment. The various fungicide treatments are as described in Table I. Evaluation of treatment effectiveness was carried out on October 14. Five rolls were randomly chosen from each pallet and five plants were chosen from each roll for a total of 25 plants. All leaves were removed from each plant and rated for disease in terms of percent leaf area affected (Horsfall-Barrett ratings). Three 100 leaf samples were dried at 50°C for 48 hours and dry weights recorded.

RESULTS:

TABLE I. RELATIVE EFFECTIVENESS OF SEVERAL FUNGICIDES IN CONTROLLING BLUEBERRY LEAF RUST

Treatment	Rate g/ai/ha	Spray Dates	% Leaf Infected	Dry Wt. g/leaf
CGA64250[1]	125	June 3	24	0.91a[2]
CGA64250	125	June 3, 22	9	0.98a
CGA64250	125	June 3, 22 July 15 August 6	3	0.90a
Bayleton[3]	225	June 3	9	1.06a
Bayleton	225	June 3, 22	9	0.99a
Bayleton	225	June 3, 22 July 15 August 6	3	0.93a
Captan/Benlate	500	August 17 Sept. 14, 22	11	0.99a

[1] Emulsifiable Concentrate - 430 grams/litre.

[2] Those numbers followed the same litter are not significantly different at the 5% level D.M.R.

[3] 50% wettable powder.

[4] Captan 50 wp. was applied on August 17, September 21 and Benlate 50 wp. was applied on September 14.

DISCUSSION AND CONCLUSION: No phytotoxicity in terms of apparent plant injury or reduced leaf dry weight occurred with any of treatments. Good control was achieved with four applications of either CGA64250 or Bayleton. The success of the Captan/Benlate combination when applied late season combined with the observation that the CGA64250, Bayleton treatments gave superior control only with late season spray applications indicates that the probable infection period for leaf rust occurs in the months of July and August in Southwestern New Brunswick. It is hoped that a re-evaluation of CGA64250 and Bayleton at a later spray interval will demonstrate a good level of control with as little as one or two applications.

STRAWBERRY CULTIVAR TRIAL

BY

E. N. ESTABROOKS

Abstract: Six new promising strawberry cultivars and selections were fruited for the second year and compared with six popular commercial cultivars being grown in the Province. Records of fruit production and growth characteristics were made. Selections Kent (K74-10) and K72-8 have been outstanding, comparing favorably with Sparkle, Vibrant, Bounty and Veestar. Redcoat, Veeglow, Vantage and Veegem were consistently lower yielding.

INTRODUCTION: This is the final report on this strawberry cultivar trial. In recent years, a number of promising new strawberry cultivars with characteristics of improved yields, flavour, shipping quality or pest resistance have been introduced. Under New Brunswick conditions, the ability to withstand the sometimes severe and changeable winters is also required. Evaluation under New Brunswick conditions for several years is required to determine winterability.

METHODS: In 1980, a strawberry cultivar trial of 12 cultivars was established at Jemseg on gravelly loam soil. The trial contained the six main cultivars now being grown in the Province - Veestar, Redcoat, Vibrant, Micmac, Sparkle and Bounty along with new releases from the Horticultural Research Institute of Ontario (cultivars Veegem, Veeglow and Vantage) and three selections from Agriculture Canada, Kentville, N. S. (K72-8, K74-5 and Kent).

The strawberry cultivars, planted out in three replications in rows 7 m long at a spacing of 135 cm between rows and 45 cm between plants were evaluated for the second fruiting year. Records of plant growth characteristics and fruit yields were made. Records of bloom dates and harvest dates were taken.

RESULTS: First bloom date information showed a spread of 3 days between cultivars (Table I). First harvest differed by 11 days among cultivars. It appeared that some cultivars have a concentrated bloom and fruiting period while others were spread out over a longer period.

TABLE I. BLOOM AND HARVEST DATES FOR TWELVE STRAWBERRY CULTIVARS GROWN AT JEMSEG, NEW BRUNSWICK 1982

Cultivar	Bloom and Harvest Dates First Bloom	First Harvest
Veestar	May 29	June 21
Vibrant	May 29	June 28
Veeglow	May 29	June 21
Redcoat	May 29	June 28
Micmac	May 30	July 2
Bounty	May 30	June 28
Veegem	May 30	June 28
Vantage	May 30	June 28
Kent	May 31	June 28
K74-5	May 31	June 28
Sparkle	June 1	July 2
K72-8	June 1	July 2

Records taken on crop yield showed a great variation from a high of 29.475 kg/ha with the Kent cultivar to a low of 9.898 kg/ha with Veegem and Vantage, but up considerably from those obtained in 1981 (Table II).

TABLE II. CROP YIELD FOR TWELVE STRAWBERRY CULTIVARS GROWN AT JEMSEG, NEW BRUNSWICK 1982 AND 1981

Cultivar	1982 Yield (kg/ha)	1981 Yield (kg/ha)
Kent	29,475 a*	17,931 a*
K72-8	23,425 b	16,853 ab
K74-5	19,136 bc	9,544 def
Sparkle	18,037 bc	12,189 cde
Bounty	17,762 bc	10,020 def
Vibrant	15,782 cd	11,159 cde
Veestar	15,287 cd	13,851 bc
Micmac	14,577 cd	12,672 cd
Veeglow	11,215 d	3,011 g
Redcoat	10,778 d	8,947 ef
Vantage	9,898 d	3,038 g
Veegem	9,898 d	7,066 f

*Means followed by like letters are not significantly different at the 5% level of the NDMRT.

Again in 1982, Kent and K72-8 were top yielding cultivars. K74-5 yielded well in 1982 and was up considerably from 1981. The next three best yielding cultivars Sparkle, Bounty and Vibrant also were among the top seven cultivars in 1981. Redcoat, Veeglow, Vantage and Veegem produced the lowest yields in both 1982 and 1981.

The largest size fruit were found in the cultivars Kent and Micmac while the smallest fruit was found in the cultivars Vibrant, Vantage and Veeglow. Fruit from cultivars Bounty and K72-8 were large at first picks but fell off in size after the first week of harvest.

DISCUSSION: The production of fruit from the new cultivar Kent was outstanding in 1982 and was consistently the best yeilder in both 1981 and 1982. Grower testing of the cultivars Kent and K72-8 is recommended.

The poor performance in 1981 by the three new HRIO cultivars Veeglow, Vantage and Veegem was believed due in part to the difficult establishment in 1980 However, after another year of plant development, these cultivars did not perform much better in 1982. Redcoat, a major commercial cultivar of the past, remains one of the poorer yeilding cultivars in the trial.

CONCLUSIONS: The new strawberry selection Kent and K72-8 outyielded the six most popular commercial cultivars at a trial in Jemseg, N. B., during 1982 and 1981. Based on two year's information, both of these cultivars should be tried by growers wishing a mid to late season harvest. (Kent considered mid season and K72-8 considered late.) Veestar continues to be a moderate early season producer while the mid-season cultivar Vibrant and the late season cultivars Sparkle and Micmac perform well. Cultivar assessment should be carried out in other New Brunswick locations.

THE EFFECT OF CULTURAL SYSTEM ON STRAWBERRY YIELDS

BY

E. N. ESTABROOKS, R. BUCHANAN, I. GHANEM

Abstract: A field trial was established in 1981 to evaluate the effect of plant density of strawberry and the degree of restriction of daughter plants (runners) on yield under the matter row cultural system using the cultivar Veestar. Plant densities varied from 12,350 to 123,500 plants/ha. Free runnering daughter plants are being compared with those restricted to 0, 5 and 10 daughter plants per plant. The raised bed system at 24,710 plants/ha and allowed to develop five daughter plants is also compared to the matted row system. The most productive systems were the high density planting, the free runner and the raised bed. The least productive was 12,350 plants/ha with ten daughters.

INTRODUCTION: Differences in strawberry yields have been attributed to variations in plant density and cultural system (1, 2). The raised bed system which has been accepted in California has produced higher yields than the traditional matted row system practiced in New Brunswick. The plant population is expected to be an important factor in determining yields.

The need to determine the optimum plant population under local conditions is evident. The objective of the project is to compare the effects of the following factors on strawberry yields:

a) Plant densities and number of daughter plants (runners) under the matted row cultural system.
b) The cultural system; the matted row system versus the raised bed system.

MATERIALS AND METHODS: The trial consisted of five treatments as outlined in Table I. Each treatment was replicated four times.

The trial was conducted at the N. B. Horticultural Center. Soil analysis indicates that soil is high in phosphorus, and potassium with pH 5.9. Fertilizer was applied at a rate of 450 kg/ha of 15-15-15 and incorporated in the soil prior to planting.

Nitrogen was applied six weeks after planting at the rate of 100 kg of urea per hectare.

TABLE I. TREATMENTS

TREATMENT	SYSTEM	NO. OF MOTHER PLANTS/HA	NO. OF RUNNERS PER PLANT
1	Matted row - free runners	12,350	Non-restricted
2	Matted row - restricted runners	12,350	10
3	Matted row - restricted runners	24,700	5
4	High density planting	123,500	0
5	Raised bed - restricted runners	24,700	5

All plants were deblossomed with the exception of treatment #4 (high density planting). The number of daughter plants per plant was restricted according to the plot plan.

RESULTS AND DISCUSSION: Yield data was collected in 1981 for treatment #4 (high density planting) and recorded. The average yield was 2698 kg/ha.

In 1982, yields were taken from all plots (Table II). The most productive planting systems were the high density planting with 123,500 plants per ha and no runners, the 12,350 plants/ha with no restriction of daughter plants and 24,700 plants/ha (raised bed) with five daughter plants. The least productive was the 12,350 plants/ha with daughter plants restricted to 10 plants.

TABLE II. YIELD DATA FROM FIVE PLANTING SYSTEMS

SYSTEM		YIELDS
NO. OF MOTHER PLANTS/HA	MAX. NO. OF RUNNERS PER PLANT	KG/HA
123,500	+ 0	14,746a*
12,350	+ no restriction	13 241ab
24,700 (raised bed)	+ 5	12,712ab
24,700	+ 5	11,036 bc
12,350	+ 10	9,342 c

*Means followed by like letters are not significantly different at the 5% level of the NDMRT.

DISCUSSION AND CONCLUSION: Although no significant differences were found between the 1982 yields from treatments 4, 1 and 5, it should be kept in mind that an average yield of 2698 kg/ha was harvested in 1981 from the high density planting (treatment #4). No significant difference in yield was found between the 24,700 plants/ha of treatments 5 and 3 (raised bed versus flat), however a significant difference was found between the 12,350 plants/ha with no restriction of runners and the same density restricted to 10 runner plants (treatments 1 and 2). Possibly damage was done in the process of removing runners accounting for the reduced yields where plants were removed.

The trial should be repeated before major changes are recommended in plant densities. Also, other cultivars beyond Veestar should be tried.

REFERENCES: 1. Buckley, Blair III and J. N. Moore. The Effects of Bed Height, Bed Width, Plant Spacing and Runner Removal on Strawberry Yield and Fruit Size. Advances in Strawberry Production, North American Straw. Growers Assoc. Vol. 1, Spring, 1982. p. 4-5.

2. Hancock, J., J. Siefker, N. Schulte and M. P. Pritts. The Effect of Planting, Spacing and Runner Removal on Twelve Strawberry Cultivars. Advances in Strawberry Production, North American Straw. Growers Assoc. Vol. 1, Spring, 1982. p. 1-3.

DEMONSTRATION OF STRAWBERRY YIELD ENHANCEMENT BY SOIL FUMIGATION*

BY

D. B. FINNAMORE, E. ESTABROOKS, B. DYKEMAN,
W. PERRY, G. READ

Abstract: Where root-lesion nematodes occur in large numbers, soil fumigation with Vorlex before transplanting enhanced strawberry fruit yield.

INTRODUCTION: This is the final report on a project to demonstrate to strawberry growers the benefits of soil fumigation, to increase strawberry fruit yield in five major production areas on commercial strawberry farms. (Finnamore, 1980). In 1981, strawberry plants, variety Veestar, were set out in fumigated and untreated plots. (Finnamore, 1981). In 1982, the first fruit yields were obtained from the plots.

RESULTS: Total strawberry fruit yields were obtained at each site from three, fifteen meter plots on plants in fumigated soil and also from three similar plots from plants in adjacent, untreated soil. Table I gives the yields of strawberry fruit in kilograms per hectare and the root lesion nematode counts in 1980 before soil fumigation. Yields were taken at four of the trial sites but due to harvesting difficulties, no yields were obtained from the Westmorland County site.

FIELD OBSERVATIONS: The Restigouche County plot was planted on the raised hill system. However, these plants were not transplanted until late in June 1981, and the plants did not have sufficient time to set a large number of fruit buds. There may have been some frost damage to blossoms in the spring of 1982 at this site.

The Carleton County plot was extensively damaged by a heavy infestation of forest tent caterpillar in 1981. The insects were controlled, but not before injury was caused to the plants. Some frost damage occurred to blossoms in the spring of 1982.

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*Financially supported by Technology Transfer Program ASA II.

The Queens County plot was on an ideal soil for strawberry plants and in a frost-free area. Transplanting was done in the early spring of 1981 and this gave the plants plenty of time to develop fruit buds. A narrow row spacing of four feet, caused crowding of the plants, and this may have reduced fruit yields at this site.

TABLE I. STRAWBERRY FRUIT YIELDS 1982
kg/ha

County	Fumigated Soil	Untreated Soil	Difference In Yield (Percentage)	Root Lesion Nematodes Untreated Soil 1980
Restigouche*	3801	4179	- 9.0	0
Carleton	7388	4867	51.8	1469
York	11320	11179	1.3	150
Queens	16130	13909	13.8	0

* The Restigouche County site was planted on a raised hill system at one hundred and fifty thousand strawberry plants to the hectare. All other sites were planted on a matted row system at twelve thousand five hundred plants to the hectare.

CONCLUSION: On the one site which recorded high nematode counts prior to planting, a 51.8% increase in yield was obtained in the soil-fumigated plot.

On all other sites, nematode levels were low or nonexistent and no significant increase in yield was obtained with fumigations. The nematode levels on these sites were undoubtedly reduced by the summer fallowing which was carried out on the year prior to planting.

Soils intended for strawberries found to have high levels of nematodes or ones which are not summer fallowed in the year preceding transplanting should, in all probability, be fumigated to increase crop prospects. Good production management practices must be followed to take full advantage of the benefits of soil fumigation.

REFERENCES: Finnamore, D. B., et al. 1980. Demonstration of Strawberry Yield Enhancement by Soil Fumigation, p. 55-56. *In* New Brunswick Department of Agriculture and Rural Development. Plant Industry Branch. Adaptive research reports 1980.

Finnamore, D. B., et al. 1981. Demonstration of Strawberry Yield Enhancement by Soil Fumigation, p. 61-63. *In* New Brunswick Department of Agriculture and Rural Development. Plant Industry Branch. Adaptive research reports 1981.

POSTEMERGENCE CONTROL OF QUACKGRASS FOR STRAWBERRIES

BY

D.J. DOOHAN

Abstract: Fusilade herbicide controlled quackgrass in strawberries at rates of 0.50 kg/ha active ingredient (a.i.) and 0.25 + 0.25 kg/ha a.i. split two weeks apart.

INTRODUCTION: Fusilade (common name fluaziprop - butyl, code number TF 1169) a postemergence, broad-spectrum graminicide is being developed in Canada by Chipman Inc. of Stoney Creek, Ontario. It is non-phytotoxic to broadleaf weeds and crops. Plans call for registration in Canada on several major and minor broadleaf crops. (Chipman Technical Bulletin). The purpose of this trial was to evaluate Fusilade for control of quackgrass in the spring of the cropping year in strawberries and to produce fruit samples for residue analysis.

METHODS: Treatments were applied to plots 2 x 5 m, randomized 4 times, consisting of 2 rows of Veestar plants. At the time of the first application, quackgrass was an average of 33 cm high. Agral 90 was added to all herbicide treatments at 0.1% of spray volume. Observations on weed control and crop tolerance were made on June 25, 1982.

RESULTS:

Table 1 Effect of Fusilade on Quackgrass & Strawberries

Treatments	Rate kg/ha a.i.	Time	Quackgrass		Strawberry	
			S*	V	S	V
Fusilade	0.125	May 31	48	28	35	29
Fusilade	0.25	May 31	66	46	41	41
Fusilade	0.50	May 31	73	49	44	43
Fusilade +	0.25	May 31				
Fusilade	0.25	June 16	73	66	75	20
Fusilade +	0.50	May 31				
Fusilade	0.50	June 16	66	58	44	43
Untreated check			40	16	35	28

* Percent Reduction in Stand (S) and Vigor (V)

CONCLUSIONS: Fusilade at rates of 0.75 kg/ha and above provided suppression of quackgrass. Further testing is required to validate the usefullness of Fusilade for quackgrass control in strawberries. High crop injury ratings were considered to be due to disease rather than Fusilade application.

RED RASPBERRY CULTIVAR TRIAL

BY

E. N. ESTABROOKS

Abstract: A red raspberry cultivar trial composed of five cultivars was established at Hoyt, N. B. in 1980. Notes about growth habit and yields were made during 1982.

INTRODUCTION: In recent years, there has been a renewed interest in red raspberries for U-pick in New Brunswick. Due to lack of local information, recommendations for cultivars has been based on test results from Nova Scotia and Prince Edward Island.

PROCEDURE: A trial composed of the five cultivars most commonly being planted in New Brunswick was established at the Horticulture Centre at Hoyt on sandy soil in 1980. Eight crowns per plot in three replications were planted at a spacing of 91 cm in the row with 182 cm between rows.

RESULTS: Results taken in 1981 indicated that Festival, Madawaska and Matsqui were the easiest to establish while Carnival and the Kentville selection (K65-12) was the most difficult. Observation of growth indicate the Madawaska and Matsqui cultivars produced the most numerous suckers. New growth on the Carnival cultivar was very short while that of Festival was longest of any of the cultivars being grown in the trial.

During the summer of 1982, the plots were ravaged by predators, first by the forest tent caterpillar and later birds, making the yield data of questionable value and unsuitable for analysis. Yields were taken in a once-over harvest on August 4, 1982.

Yields of up to 3150 kg/ha was taken from one Festival plot but yields for most cultivars were in the area of 300 kg/ha. It was obvious from observation prior to harvest that fruit crop in the Festival cultivar was much heavier than any of the others.

CONCLUSIONS: It is not possible to draw any conclusions from the partial results obtained. In 1983, it will be necessary to establish better predator controls so that accurate yield data can be obtained.

THE UNHEATED GREENHOUSE STRUCTURE*

BY

ANDREW CURRIE, RENALD CORMIER AND GEORGE READ

Abstract: Two low-cost greenhouse structures were constructed, one in Hoyt, the other at Keswick Ridge. The purpose was to evaluate the crop production capabilities in unheated greenhouse structures. Temperatures were continuously recorded throughout the production period. Seven high-value vegetable crops were grown from May until October in an attempt to demonstrate the potential for a lengthened vegetable production season.

INTRODUCTION: In New Brunswick, vegetable production in the field is limited by frost-free periods and conventional greenhouse production is limited by high energy costs. In an attempt to extend the production cycle of vegetables earlier in the spring and later in the fall, a concept relatively new to New Brunswick was evaluated.

An unheated greenhouse structure can be planted in late April and cropped until early November with very little heat requirement.

MATERIALS AND METHODS: The structures were constructed using black iron pipe. Each rib consisted of two pipes, butt welded and bent to form an arc. The ribs were simply imbeded in the ground, each end about 0.3 meters into the soil. Each greenhouse was 24 meters long, consisting of 11 ribs spaced 2.4 meters apart. At the peak of the greenhouse, black iron pipe was welded along the entire length, being attached to all eleven ribs. Diagonal side braces consisting of 2.5 cm pipe were welded from the end rib at a point 1.5 m above the ground to a point on the third rib at ground level. The intersection of this diagonal brace where it crossed the second rib was also welded. This same procedure was appliea t the four corners of the greenhouse to provide stability. (Refer to Diagram 1.)

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The second stage of construction involved the attachment of 5 cm x 15 cm lumber around the perimeter of the structure. Small holes were drilled through the pipe and wood so carriage bolts could be placed in the holes. This further strengthened the structure. The lumber around the base also served as an anchor for attaching the plastic cover.

Lumber (5 cm x 10 cm) was attached along the underside of each end arc. They were attached by U bolts to the pipe. Vertical wooden pieces were erected to serve as a track for rolling the end flaps up and down. The flaps would be opened and closed to allow natural ventilation throughout the summer.

A 4 ml greenhouse poly cover measuring 30 m x 12 m was used to cover the entire structure. The poly was attached to the wooden frames by wooden strapping and nails.

In an attempt to study and evaluate the variabilities within the structures, two designs were implemented. At Hoyt, a structure 2.1 meters high and 10.5 meters wide was constructed. This design was used in an attempt to maximize the square footage under the structure.

At Keswick Ridge, a structure 3.6 meters high and 9 meters wide was built. This facility was designed much in the same manner as a normal quonset greenhouse. It would allow culture closer to the side walls, especially for higher crops.

Upon completion of the structures, the soil was prepared. Since Hoyt had a loamy sand and Keswick had a clay loam, different fertility programs at each site were necessary.

Each of the seven crops received the fertilizer they would require for normal growth. This depended on the soil test for the site. The fertilizer applied was granular 10-10-10.

Once the fertilizer was thoroughly incorporated into the soil, drip irrigation was laid. Two lines of irrigation was placed under each row of black plastic mulch. Nine rows of black plastic was laid at Hoyt while eight rows were laid at Keswick.

Holes were cut in the black plastic with a propane burner. The spacing depended on the crop under culture.

Each crop had 3.3 linear meters of greenhouse space except lettuce which had 4.2 meters, using all rows of mulch.

The crops and spacing were as follows:

Variety	Spacing
Superset Peppers	30 x 90 cm
Sprint 440 Cucumbers	45 x 90 cm
Black Jack Zucchini	45 x 90 cm
Snow Crown Cauliflower	45 x 60 cm
Early Girl Tomatoes	30 x 90 cm
Queen Crown Lettuce	30 x 30 cm
Montello Lettuce	30 x 30 cm
Alaska Canteloupe	45 x 90 cm

RESULTS:

TABLE I. THE COST OF CONSTRUCTION AND MAINTENANCE

Materials	
9 m x 6.6 m x 2.5 cm black iron pipe	$1,011.00
5 cm x 10 cm and 4 cm x 15 cm lumber	80.00
Wooden strapping	10.00
Carriage bolts	7.00
4 ml plastic greenhouse cover	200.00
Drip irrigation and mulch	75.00
Plant materials	100.00
Fertilizers and pesticides	70.00
	$1,543.00
Labour	
Erection costs - 3 men x 12 hours x $5.00 per hour	$ 180.00
Crop harvesting and maintenance - 1 x 4 hours per week x $4.50	18.00

DISCUSSION: The construction of the range can be easily completed in a twelve-hour period by three workers. The most time-consuming aspect of erection is the welding of all the pipes. It is advisable that a reliable portable welder be used.

When attaching the plastic to the structure, a snug fit on the structure and careful fastening will result in reusable poly. This is important, especially if the cost of the cover can be depreciated over two years.

The ends of the greenhouse should receive special attention since they will serve as the only source of ventilation throughout the summer. On the ends, a 6 m wide flap is cut in the polyethylene which can be rolled up and down to facilitate ventilation.

The poly cover is designed to last at least two years. The structure should be uncovered in November and the cover reapplied in early April. This will lengthen the life of the poly as it does not have to be exposed to winter conditions.

Since the ribs are spaced 2.4 meters apart, they would not be capable of taking winter snow loads. Therefore, the structure must be uncovered during winter months.

The ventilation system used in the unheated greenhouse structure relies on natural air dynamics. Twenty-four meters is the maximum length for greenhouses relying on natural ventilation. This length will allow adequate cooling for most warm season crops. The average maximum air temperature was about 30°C with an extreme of 41°C which lasted only a short period. Hoyt was generally warmer than Keswick. The high structure at Keswick picked up more breeze movement and thus was generally cooler than Hoyt.

The ventilation system should be rolled up early in the morning once the outside temperatures are condusive for good plant growth. During early May, the external air temperatures may be low. A certain amount of air exchange is required for normal plant development. The structure will warm up quickly on sunny days even when the outside temperatures are cool. This necessitates a gradual opening of both ends. Early in May, a small opening is necessary. This should be closed as soon as the air temperature drops. Careful attention must be paid to the time of closing. Conservation of heat is critical.

Frost periods may be expected in the period of May-June. From the data taken in 1982, we were required to supply supplementary heat on 15% of the nights during that period. Using two 9,000 B.T.U. kerosene heaters, we were able to ensure our crop's survival from frost. From Table II, it may be seen that at an outside temperature of -4.0°C was experienced with an internal temperature of 0°C. This resulted from heater failure due to lack of fuel.

In the warmer months, the covers were left open 24 hours a day. As fall weather results in cooler temperatures, the ends should be opened and closed as necessary.

25-30°C is a good target area for the warm season crops. The early and late cold season crops will tolerate cooler temperatures and will perform adequately at a few degrees above freezing for short periods.

Irrigation of the crops is necessary as the development of the plants is very rapid and high temperatures cause high levels of evapo-transpiration. In an effort to conserve moisture and gain heat in the soil, black plastic mulch was used. The irrigation system used allowed for a gradual saturation of the soil when needed. Heat retention by the soil is greater in a moist soil than a dry one. Therefore, the watering was usually done by mid-morning. Table II illustrates the advantages of the plastic mulch in heat retention.

Overwatering should be avoided. It not only results in fertility loss but excess will also encourage waterlogging of roots and thus disease. The soil type will dictate the water requirements for each crop.

Since the crops were planted across the greenhouses, watering had to be done when any one crop required water. This is not advisable. If a variety of crops are desired, each crop should be grown in a row or rows by itself. This would facilitate more controlled watering when needed, as well as good potential for supplementary feed application if required.

On long-term crops, supplemental fertility will be required to maintain adequate nutrient levels.

Crop requirements are crucial. Any compromise in soil fertility will be detrimental to yield and returns.

Table III illustrates the variability found in the two separate project areas. Differences are attributed to the poor soil fertility at Hoyt which resulted in very poor cauliflower growth as well as reduced vigor on tomatoes and peppers.

Keswick had good fertility characteristics, however, water penetration was slow. Canteloupe in particular suffered from excess water.

Like any typical greenhouse cultured plants, the vegetables grown in the unheated structures are going to grow rapidly. The lush, succulent foliage is a perfect host for a variety of insects. Whitefly and aphids were a major problem at both sites. Effective insecticides were applied. Unfortunately, applications were not followed up frequently enough. The insecticides were unable to completely interrupt the insects life cycles.

The crops grown for this production system should be kept free of pests from the seedling stage onwards. Proper crop development will occur and yields maximized only with good insect control.

Table IV details the projected gross and net returns that may be expected if a grower was culturing 93 m^2 of each crop. The gross returns are an average of the two sites extrapolated to 93 m^2.

The dollar returns were based on the flucuating prices a grower might expect for produce. They are, in effect, the retailers purchase price.

Table V illustrates the procedure for deriving the annual capital cost. Based on a total cost of construction and amortizing the cost over five years at 12% interest, the annual fixed cost would be $234.85 on 93 m^2 of space. Subtracting the annual operating cost which included crop material, maintenance, labour and other associated costs, annual net return results. The only deficit results are in canteloupe. The highest value crop is tomatoes.

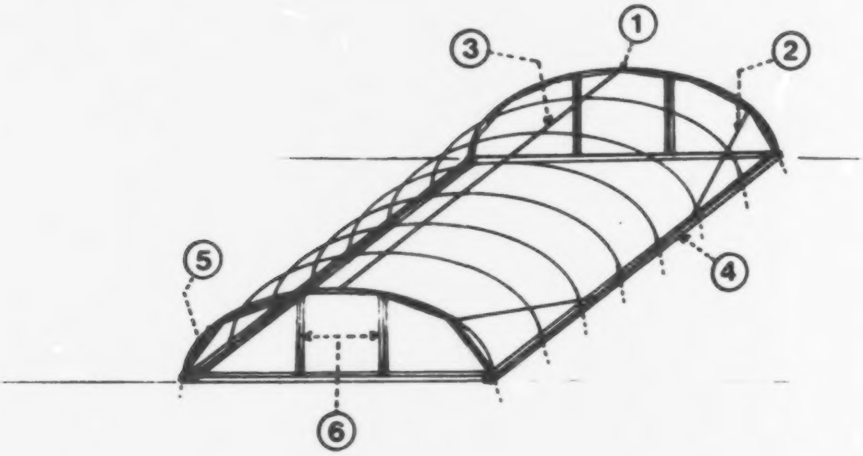
These figures depend upon the success of the grower in obtaining good yields. There were weak areas of production at both areas in our trials.

TABLE II. TEMPERATURE MONITORING AT HOYT

May 6 - June 6 (31 days)	Outside °C Greenhouse	Inside °C Greenhouse
Ave. Maximum Air Temp.	19.93	29.85
Ave. Minimum Air Temp.	4.77	8.77
Extreme Maximum Air Temp.	30.50	41.50
Extreme Minimum Air Temp.	-4.00	0.0
(18 days)		
Ave. Maximum Soil Temp. 5 cm.	19.27	28.66
Ave. Minimum Soil Temp. 5 cm	10.02	14.77
G.D.D.* Above 5°C (cool)	222	437.5
G.D.D. Above 10°C (warm)	95	278

*G.D.D. - Growing degree days.

DIAGRAM 1. UNHEATED GREENHOUSE STRUCTURE CONSTRUCTION DETAILS



1. Two pipes butt welded to form an arc.
2. Diagonal side brace.
3. Main ridge pipe.
4. Perimeter base lumber.
5. Wooden anchoring frame for poly (attached to arc by U-bolts).
6. Vertical wooden frame (supports for fastening roll up ventilation doors).

TABLE III. TOTAL YIELDS AND RETURNS FROM VEGETABLES IN UNHEATED GREENHOUSES MAY-NOVEMBER 1982

Crops	Marketable Yield At Hoyt	Gross Returns	Estimated Crop Loss
Tomatoes	206.8 kg	726.94	5%
Cauliflower	Crop failure		100%
Zucchini	98.4 kg	167.59	10%
Cucumber	1066 pc	418.62	15%
Canteloupe	99 pc	102.55	20%
Peppers	84 kg	183.54	12%
Lettuce	308 pc	304.42	5%
Total Gross Dollar Return		$1,904.16	

Crops	Marketable Yield at Keswick Ridge	Gross Returns	Estimated Crop Loss
Tomatoes	422.5 kg	1,293.26	10%
Cauliflower	133 pc	192.85	2%
Zucchini	107.7 kg	146.74	10%
Cucumber	716 pc	291.48	5%
Canteloupe	44 pc	55.00	50%
Lettuce	242 pc	239.58	10%
Peppers	103 kg	241.78	3%
Total Gross Dollar Return		$2,460.69	

TABLE IV. AVERAGE PROJECTED COST & RETURNS FOR 93 m^2 (1000 $ft.^2$) OF SPACE PER CROP

Crop	Gross Return* ($)	Annual Capital Cost	Annual Operating Cost**	Annual Net Return
Lettuce	648.07	234.85	60.08	353.14
Cauliflower	584.34	234.85	75.80	273.69
Zucchini	476.21	234.85	113.30	128.06
Cucumber	1,075.80	234.85	143.30	697.65
Canteloupe	238.69	234.85	143.30	-139.46
Tomatoes	3,060.61	234.85	203.30	2,622.46
Peppers	728.25	234.85	158.30	335.10

* Retailers purchase price.

**Annual operating cost varies depending on the length of time required for crop maintenance (i.e. number of weeks crop is grown). Also includes the fuel cost required for frost protection in May-June 1982.

TABLE V. CONSTRUCTION COSTS

Materials	$ 1,543.00
Labour	180.00
Heaters	400.00
	$ 2,123.00

Cost per $ft.^2$ based on 2,400 $ft.^2$ (223 m^2) = .88

Construction cost amortized over 5 years of production at 12% interest:

5 years $ 2,818.20

93 m^2 = 234.85 Yearly Payment $ 563.64

The retailers purchase price will determine the overall returns to the grower.

Spacing of the crop is crucial. Ideal spacings are required. The only crop that was underutilizing its area was peppers. Double rows should have been planted instead of single rows.

CONCLUSIONS: The unheated greenhouse structure has potential. Its capabilities for producing earlier and later in the vegetable season opens up a new dimension for the fresh market grower. Optimum prices for local produce is attainable. The concept is not designed for the wholesale trade but rather for the vegetable stand operator who wants to offer a top quality product longer and at a premium price. This approach will provide a fair return for the extra investment required for this cropping system.

REGIONAL BEDDING PLANT TRIALS

BY

A. W. CURRIE

Abstract: Bedding plant trials were carried out at the Horticulture Center in Hoyt to evaluate varieties of marigold, fibrous rooted begonia, petunia, celosia, seed geranium, ageratum, zinnia, delphinium, alyssum, vinca, verbena, ornamental pepper, pansy, kochia, dianthus, mimulus, as well as a collection of California seed species. Data recorded included: spread, height, bloom size and ratings of performance.

INTRODUCTION: In a yearly colaboration with the Nova Scotia, Prince Edward Island and Canada Departments of Agriculture, new varieties of various bedding plants are evaluated for suitability under Maritime conditions. This year Bodger and Denholm seed companies also forwarded a variety of seeds for additional evaluation.

RESULTS: Readings from the trials include spread, height and bloom size all in centimeters as well as a rating out of 50. In addition, bloom trueness to type and plant adaptation and resistance were evaluated.

Varieties are listed in order of performance. Readings were recorded on July 27th from a June 7th transplanting.

Sources for all seed material is listed in the tables. The code is as follows:

A - Ball Superior Ltd.
B - Bodger Seeds Ltd.
C - Stokes Seeds Ltd.
D - Denholm Seeds
E - Jack Van Klaveren Ltd.

All results are compiled in an Atlantic Summary. These are available from the Department of Agriculture for interested growers.

The study undertaken in New Brunswick is this paper's source.

A. Geranium July 27

Variety	Plant Height	Plant Spread	Bloom Size	Rating	Source
Cherie 80	29	30	11	50	E
Ringo Rose	31	32	9	50	A
Sprinter White	35	34	10	50	E
Smash Hit Rose Pink	37	27	8	50	A
Sooner Red	37	34	12	50	A
Ringo Rouge	27	25	9	49	A
Smash Hit Salmon	27	21	9	48	A
Scarlet Marathon	37	42	9	48	A
Cameo	36	30	11	47	A
Bright Eyes	27	25	9	47	A
Razzmatazz	26	26	8.5	47	A
Cherie	28	29	10	47	A
Rosita Improved	30	27	9	47	A
Orbit Salmon	23	23	7	46	A
Playboy Orange Scarlet	24	17	7	46	A
Red Marathon	37	25	9.5	46	A
Rose Marathon	37	32	11	45	A
Smash Hit	20	23	8	45	A
Playboy Cherry Red	21	19	11	44	A
Ringo Scarlet	27	21	10	44	E
Red Pimpernel	28	24	13	44	E
Capri White	26	25	9.5	44	A
Snowdon	35	32	9	43	A
Appleblossom Pink	31	21	8	43	A
Sprinter Deep Red	24	24	7	42	E
Rosita Improved	19	21	9	42	A
Capri Brick Red	24	22	8.5	42	A
Merlin	28	21	10	42	C
Orbit Coral	21	17	7	41	A
Ringo Dolly	28	30	8.5	41	E
Orbit Red	31	19	11	41	A
Sprinter Salmon	35	25	9.5	37	A
Orbit Scarlet	23	17	7	35	A

B. Fibrous Begonia July 27

Variety	Plant Height	Plant Spread	Bloom Size	Rating	Source
Venus	18	19	3.5	50	A
Foremost Pink	18	21	4	50	A
Mars	17	24	4.5	50	A
Lynda	13	20	3	50	A
Fi Rose Sensation	20	23	5.5	50	A
White Jet	18	27	2.5	50	A
Pink Planet	20	30	2.5	50	A
Caravelle Pink	21	25	4.5	50	A
Glamour White	24	34	4.5	50	A
Venus 939	18	24	4	49	A
Glamour Rose	20	20	6	49	A
Pink Comet	18	20	2	48	A
Louise	14	18	2	48	A
Derby	15	18	3	48	A
Caravelle Rose	20	16	4	48	A
Red Pearl	17	20	3	47	A
White	12	17	3	47	A
Gin	14	21	3	47	A
Northern Lights	14	17	2.5	46	A
White Comet	12	19	3	46	A
Frilly Pink	17	22	4.5	46	A
Glamour Red 1802	21	20	4.5	46	A
Scarletta	15	20	3	46	A
Danica Scarlet	14	16	3	45	A
Foremost Red	10	15	3.5	44	A
Glamour Red	15	19	5	44	A
Rose Comet	12	12	1.5	44	A
Gladiator	13	8	4	43	A
Fully Red	16	12	4	43	A
F. Scarlanda	18	15	3	43	A
Rose Salmon Jet	19	15	2	42	A
F. Dwarf Bronze Fol. Brandy	13	14	2	41	A
Pink Jet	9	10	2.5	39	A
Red Jet	8	12	2	39	A
Caravelle Mixed	23	24	3.5	50	A

C. Marigold July 27

Variety	Plant Height	Plant Spread	Bloom Size	Rating	Source
Super Double Crested Panther	22	23	5	50	-
Dwarf Triploid Honeybee	24	30	6	50	A
Honeycomb	22	26	5	50	A
Calanda Apricot	31	33	10	50	A
Spinwheel	24	30	5.5	50	A
Goldfinch	27	35	6	50	A
Apollo	28	26	5	50	E
Moonshot	32	35	7	50	E
Happy Face	51	47	10	48	A
3N Solar Gold	30	35	6	49	A
Orange Jubilee	64	33	10	48	C
Queen Bee	18	20	4.5	49	C
Nell Gwyn	38	45	6	48	C
Queen Sophia	25	27	5	49	C
Dwarf Calanda Lemon Yellow	36	24	6	48	A
Midas Touch	19	23	5	48	E
F. Hybrid Dwf. Double Giant Sunshot	34	32	8	47	A
Red Seven Star	35	37	6	47	E
Gold Strike	25	23	45	47	A
Oranger Winner	20	27	5	47	-
Janie Flame	19	20	3	46	C
F. Gold Galore	35	31	10	46	E
Petite Orange	15	18	2	45	C
Harvest Moon	22	23	4.5	45	C
Yellow Galore	42	35	9	45	E
Sunshot	28	31	8	45	A
3 N Sunrise	24	24	5	44	A
Glowing Embers	20	21	5	44	A
Encore	24	25	5	43	A
Bonanza Yellow	18	13	3	43	A
Janie	19	12	3	43	A
Yellow Boy	10	12	3	42	E
Single 3N Susie Wong	30	24	5	42	A
Super Double Crested Stardust	24	21	4	40	-
Yanie Yellow	13	9	2.5	31	C

D. Petunia July 27

Variety	Plant Height	Plant Spread	Bloom Size	Rating	Source
Red Ensign	33	42	8	50	A
White Cascade	33	38	9	50	A
El Toro	28	40	6	50	C
Recoverer White	28	30	8	50	A
Tango	48	41	8	50	A
White Flash	30	38	10	50	A
Ultra Red	30	49	7	50	A
Snowcap Improved	40	50	9	50	A
Candy Apple	30	30	8	50	A
Red Knight	27	45	6	50	A
Glacier	42	38	8	50	A
Scarlet Magic	25	36	7	49	C
Red Flash	28	34	6	49	A
Red Cloud	36	30	8	49	C
Bravo	39	42	8	49	C
Snow Magic	27	36	9	49	A
White Ensign	35	41	7.5	49	A
Sparkler	27	30	9	48	A
Snow Cloud	30	27	10	48	A
Red Magic	32	42	8	48	A
Ultra White	28	27	7	48	A
La Paloma	26	40	5	48	A
White Magic	39	50	7	48	C
White Knight	27	39	5	48	A
Red Cascade	24	36	6	48	A
Red Baron	32	40	6.5	46	A
Apollo	29	26	6	41	E

E. Celosia July 27

Variety	Plant Height	Plant Spread	Bloom Size	Rating	Source
Golden Touch	18	19	5	50	A
Plumosa Crusader	26	13	8	50	A
Dwarf Plumosa Scarlet Gem	10	16	6	50	A
Extra Dwarf Orange Feath.	18	13	11	50	E
Lilliput Fiery Feather	22	25	10	50	A
Lilliput Golden Feather	20	18	11	47	A
Extra Dwarf Yellow Kewpie	12	7	7	43	A
Extra Dwarf Yellow Kewpie	12	7	7	43	A

F. Bodger Seed Company July 27

Variety	Plant Height	Plant Spread	Bloom Size	Rating	Source
Zinnia-Dasher Scarlet	36	22	7	48	B
Small World Cherry	27	22	6	49	B
Dwarf Orange	26	30	7	49	B
Yellow Ruffles	34	28	7	49	B
Pink Ruffles	49	40	6	49	B
F. Ruffles Mix	38	30	7	49	B
Tall Dahlia Flowered-Crimson	56	36	13	46	B
Pacific Yellow	44	37	8	49	B
Scarlet Ruffles	47	40	7	49	B
Pom Pom Pink	23	25	6	49	B
Cosmos-Sunny Gold	22	16	2.5	45	B
Lemon Twist	21	16	3	33	B
Pansy-Large Flowered Mix	18	20	7	40	B
Kochia-Acapulco Silver	33	21	-	30	B
Dianthus-Frosty Mix.	34	22	5	50	B
Mimulus-F. Experimental	20	24	4	37	B
Marigold-Torch	23	29	5	50	B
Honey Moon	22	29	4	50	B
Gazania-Bronze Red	24	32	9	45	B
Moss Verbena	18	45	2.5	43	B
Fernleaf Yarrow	14	32	-	26	B
Delphinium-Coast Larkspur	20	20	2	37	B
Desert Marigold	10	13	-	47	B
Southwestern Verbena	14	26	3	45	B
Coreopsis-Dwarf Red Plains	24	17	3	44	B
Lupin-Densafloris Mixed Colors	20	25	-	50	B
Grayhead Coneflower	20	37	-	50	B

Variety	Plant Height	Plant Spread	Bloom Size	Rating	Source
Marigold-Susie Wong	30	34	6	44	B
Queen Sophia	20	24	5.5	50	B
F. Viking	35	32	8	49	B
Papaya Crush	20	14	7	45	B
Golden Jubilee	45	33	9	50	B
F. Gold Coins Mixture	80	60	11	50	B
Golden Nugget	19	17	3	41	B
Guys & Dolls	21	20	6	44	B
Gold Galore	39	24	8	47	B
Scarlet Sophia	20	18	5	46	B
Pumpkin Crush	19	21	8	47	B
Gem Mixture	27	42	2.5	50	B
Pineapple Crush	25	25	8	48	B
Ageratum-Blue Danube	18	16	4.5	50	B
Zinnia-Ambrosia Mix	45	28	10	48	B
Aster-Super Bouquet Mix	40	23	6	47	B
Delphinium-Blue Fountains	19	28	5	31	B
Alyssum-Wonderland	6	16	1.5	50	B

G. Denholm Seed Company July 27

Variety	Plant Height	Plant Spread	Bloom Size	Rating	Source
Ornamental Pepper-Candlelight	15	9	-	45	D
Geranium-Smash Hit Red	30	29	10	46	D
Vinca-Pink Carousel	17	21	-	47	D
Morning Mist	20	17	-	49	D
Marigold-Glowing Emb.	20	24	5	49	D
Boy-O-Boy Mix.	24	23	4	50	D
Yellow Girl	17	16	3	43	D
Red Cherry	27	21	5	45	D
Verbena-Shoutene Mix.	20	23	5	45	D
Delphinium-Blue Springs	17	12	-	40	D

DISCUSSION: The plants were irrigated when they required supplementary moisture. In general, the growing season was cool and rainfall was adequate. The plants were not killed by frost until well into October.

Geranium growth was very good this year and five varieties performed equally well. Cherie 80 was the most appealing with the larger bloom size evident all summer long.

Fibrous Begonias grew extremely well this year. Nine varieties performed excellently with Venus, Foremost Pink and Mars being the most uniform and colorful.

The Marigold crop did not meet the standards set last year. The climatic conditions, certainly played a major role in their quality. Super Double Crested Panther and Honeybee were the outstanding varieties.

The Petunias grew very poorly this season. Sudden rain showers caused a severe flower quality problem. This year, the evaluations were primarily carried out on the red and white varieties. The plants were evaluated during one of their better days of flowering. Red Ensign, White Cascade and El Toro performed equally well.

The Celosia crop was colorful yet rather stunted and foliage was sparse.

The seeds from Bodger and Denholm proved to provide an interesting variety of plant material. The new introductions were colorful and proved to be good material to view and study. Overall, the weed flowers were sparse and many plants did not perform until later into the season.

CONCLUSION: The trial's aim over the next few years will be to compile data on a variety of plant material. Bedding plants can be screened for our climatic conditions from this study. The process will take at least three continuous years of planting for any one variety. After this period, definite conclusions can be drawn and the better species recommended on merit.

POINSETTIA MEDIA TRIAL

BY

ANDREW CURRIE AND WAYNE PERRY

Abstract: Ninety Poinsettia plants were potted in mid-August as cuttings and grown until late November, at which time measurements on plant height, width and bract size were recorded. The media used were: sawdust:peat:vermiculite, 1:1:1; peat:soil, 1:1; and a commercially prepared mix: A.S.B. #1. A.S.B. proved to be the most disease-free media and plant response was good.

INTRODUCTION: A variety of soil mixes are used by Poinsettia growers in the Province. Many encounter cultural problems with various mixes. In an effort to study and demonstrate the potential for a variety of mixes, sawdust, soil and a commercial mix were used. If a grower can rely on a specific mix for consistent uniform plant quality and size, he will certainly be more financially secure. Heavy soils which retain large amounts of moisture will not permit constant feeding or in the long run adequate plant growth.

MATERIALS AND METHODS: 60 Annette Hegg Dark Red, 15 Annette Hegg White and 15 Annette Hegg Pink rooted cuttings were obtained from Jack Van Klareren Ltd. The cuttings were divided up among the three sterilized media treatments. The first was a peat + sawdust + vermiculite 1:1:1 mixture, secondly a soil + peat mixture 1:1 was prepared. Each was amended with lime to give a pH of 6.0. Micro elements and fine super phosphate were added. The other nutrient requirements were supplied by a continuous feed of 20-20-20 at 200 ppms. "A Rest" growth regulator was applied three weeks after pinch. Benlate 50 wp and Truban 30 wp were applied every three weeks for root rot.

RESULTS:

TABLE I. POINSETTIA MEDIA TRIAL

Treatment	Ave. Height	$\bar{x}$	Ave. Width	$\bar{x}$	Ave. Bract Diameter	$\bar{x}$
Sawdust-Red	18.7**	18.9a*	21.4	19.6b	12.1	11.5d
Sawdust-Pink	21.4		20.1		12.7	
Sawdust-White	16.8		17.4		9.6	
Soil-Red	22.5	20.4a	27.3	24.2bc	14.7	13.5de
Soil-Pink	21.8		21.4		13.0	
Soil-White	17.0		23.8		12.8	
A.S.B.-Red	27.6	34.2a	38.4	38.1c	14.0	15.7e
A.S.B.-Pink	49.0		50.0		18.0	
A.S.B.-White	26.0		26.0		15.0	

* Numbers followed by same letter within the categories are not significantly different at the 5% level DMR.

**All measurements are in centimeters.

$\bar{x}$ Values are the mean values for all three colored plants within each of the three treatments.

DISCUSSION: Successful Poinsettia growth can be achieved only when a proper soil mix is present. The use of peat moss, perlite, vermiculite, sand, wood residue and plastics permit reliable and reproducible mixes. Natural soils, composts and manures are not always reliable or true to form.

In Poinsettia growth, a medium should have a good mixture of large and small pore spaces in the soil. A reasonable proportion of large pores is desirable, they are necessary for efficiency in water flow throughout the mix as well as for air spaces after watering has occurred.

A mix should be selected so that it will not compact easily. This will insure proper pore space.

The medium containing soil did not have adequate pore spaces. It remained waterlogged for long periods after moderate watering.

Table I illustrates the effects of the various medias on plant height, width and bract diameter. Following statistical analysis on each category, the following results were found. There was no significant difference in heights. There was a significant difference in the plant widths, particularly between sawdust and A.S.B. Bract diameter proved to be significantly different in sawdust and A.S.B.

Visual observations showed that the sawdust and soil medias were very heavy and root development was slow. The best looking plants were definitely in the A.S.B. mix.

A.S.B. required a lot of moisture, when compared with the other mixes.

CONCLUSIONS: Poinsettias will perform very well in dry media. Heavy, moist media tend to cause growth lags and lack of performance. Growers should pay careful attention to their Poinsettia medium. Root rot can be minimized and quality improved by using a mix like A.S.B.

RELATIVE EFFICACY OF SEVERAL FUNGICIDE DRENCHES IN CONTROLLING DAMPING-OFF

BY

ANDREW CURRIE AND KELVIN LYNCH

Abstract: Three different fungicide drench treatments were evaluated for efficacy in controlling damping off. Truban 30 w.p. + Benlate 50 w.p. (0.37 g/L + 0.5 g/L) was the best treatment increasing both plant stand and plant weight as compared to the untreated.

INTRODUCTION: Damping-off which is always a threat to bedding plant production is often induced by a combination of fungi. In general no one fungicide is capable of controlling all such fungi so the efficacy of several fungicide combination drench treatments was evaluated.

MATERIALS AND METHODS: Speedling trays were potted with an unsterilized mix of peat:soil:vermiculite (2:1:1) and planted with 5 seeds per cell of either Dwarf Queen Superb Mix aster or Plumosa Feathered Golden Triumph celosia. In addition each cell received one 5mm x 5mm piece of corn meal agar colonized by Pythium ultimum[1] and one oat seed colonized by Rhizoctonia solani[1]. The experimental design consisted of RCB with 8 replications and 10 cells per replication. Trays were drenched immediately after planting with the following fungicides; (rates are given in terms of product) Quintozene 75 w.p. 1.0 g/L, Lesan 35 w.p. 1.1 g/L, Benlate 50 w.p. 0.5 g/L, Truban 30 w.p. 0.37 g/L, and No Damp 10 ml/L. All drenches were applied at a rate of 6.1 L/m^2 with the Truban + Benlate treatment receiving an additional follow-up drench of water at 3.0 L/m^2. All treatments were rated, cut and dried at 50°C for 48 hours 20 days after seeding.

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[1] Original cultures for both Pythium ultimum and Rhizoctonia solani were obtained from Dr. L.V. Edgington, U. of Guelph, Guelph, Ontario.

RESULTS: Relative Efficacy of Several Fungicide Drenches in Controlling Damping-Off

Treatment	Celosia		Aster	
	% Emerg.	Wt/pt	% Emerg.	Wt/pt
Untreated	52b*	0.0014b**	43a	0.0039b
Quintozene + Lesan	25a	0.0013a	50a	0.0031a
Truban + Benlate	69c	0.0020c	76c	0.0052d
No Damp	46b	0.0015b	62b	0.0048c

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* Numbers followed by the same letter are not significantly different at the 5 percent level DMR.

** Average dry weight per plant in grams.

DISCUSSION AND CONCLUSION: For celosia the Truban + Benlate drench was best increasing plant stand by 33 percent and plant weight by 42 percent. The Quintozene + Lesan drench proved phytotoxic as compared to the untreated.

For aster the Truban + Benlate drench was once again superior increasing plant stand by 77 percent and plant weight by 33 percent as compared to the untreated. The Quintozene + Lesan drench was phytotoxic reducing plant weight by 20 percent as compared to the untreated.

RELATIVE PHYTOTOXICITY OF SEVERAL FUNGICIDE DRENCHES ON VARIOUS ORNAMENTALS

By

ANDREW CURRIE AND KELVIN LYNCH

Abstract: Three different fungicide drench treatments were evaluated for phytotoxicity. One, Quintozene 75 wp plus Lesan 35 wp (1.0 g/L + 1.1 g/L) caused reduced germination, stunted growth and plant distortion on some ornamentals.

INTRODUCTION: The value of fungicide drenches in controlling damping off of bedding plants is considerable. However, registrations are often in general terms, i.e. bedding plants, and problems with phytotoxicity on certain types of plants or even particular varieties can occur.

MATERIAL AND METHODS: Speedling trays were potted with a mix of peat:soil:vermiculite (2:1:1) and planted with 5 seeds per cell. The experimental design consisted of a RCB with 4 replications, and 20 cells per replication. Trays were drenched immediately after planting with the following fungicides: (rates are given in terms of product) Quintozene 75 wp 1.0 g/L; Lesan 35 wp 1.1 g/L; Benlate 50 wp 0.5 g/L; Truban 30 wp 0.37 g/L; and No Damp 10 ml/L. All drenches were applied at a rate of 6.1 L/m^2 with the Truban + Benlate treatment receiving an additional follow-up drench of water at 3 L/m^2. Aster, marigold and zinnia treatments were cut 20 days after seeding and the remainder 27 days after seeding. Plants were dried for 48 hours at 50°C and dry weights recorded.

TABLE I. RELATIVE PHYTOTOXICITY OF FUNGICIDE DRENCHES ON DIFFERENT ORNAMENTALS

Bedding Plant Varieties	Untreated		Quinto + Lesan		Truban + Benlate		No Damp	
	% Em	Wt/P	% Em	Wt/P	%Em	Wt/P	%Em	Wt/P
Zinnia (Lilliput Mix)	68a*	.0a**	66a	.9a	74a	.9a	74a	.0a
Aster[1]	70a	.6a	64a	.4b	88a	.6a	73a	.5a
Petunia[2]	100a	.3a	59b	.2b	100a	.4a	87a	.4a
Pansy (Universal Mix)	82a	.5a	82a	.4a	88a	.5a	82a	.5a
Ageratum (Blue Cap)	-	.3a	-	.1b	-	.3a	-	.3a
Alyssum (New carpet of Snow)	76a	.4a	68a	.3a	81a	.4a	85a	.4a
Alyssum (Rosie O'Day)	79a	.3a	66a	.2b	80a	.4a	85a	.4a
Marigold	89a	.6a	68a	.6a	77a	.7a	86a	.6a

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* Numbers followed by same letter within the species are not significantly different at the 5% level DMR.

** Average dry weight per plant in miligrams.

[1] Aster (Dwarf Queen Superb Mix).

[2] Petunia (F_1 Multiflora Double Cherry Tart).

DISCUSSION AND CONCLUSION: Neither zinnia or marigold were adversely affected by any of the treatments. The Quintozene + Lesan drench delayed germination and stunted growth for petunia, alyssum (Rosie O'Day), ageratum, aster, pansy and alyssum (New Carpet of Snow) although this reduced growth was not found to be statistically significant for the last two. This treatment also produced plant distortion for aster and Rosie O'Day alyssum and reduced the percent germination for petunia and both alyssums although for the alyssums, this reduction was not statistically significant. No phytotoxicity was observed for either the Truban + Benlate or No Damp drench treatments.

WEED CONTROL FOR ORNAMENTAL NURSERY STOCK

BY

D. J. DOOHAN

Abstract: Surflan and Surflan/Princep treatments gave good control of annual weeds on several ornamental trees and shrubs.

INTRODUCTION: Princep has been recommended for weed control in ornamental nursery crops for several years. Princep is limited in that it cannot be used during the establishment year and does not control annual grasses. Surflan has been recommended for control of annual grasses and broadleaf weeds since 1977 but has yet not been registered. The manufacturer, Elanco, is presently anticipating registration in 1983 or 1984.

METHODS: Treatments of Surflan and Surflan/Princep were applied to an ornamental nursery at Island View on June 4, 1982. Nursery stock had been established in the silt-loam soil for at least 1 year. The following ornamentals were included in the trial; snowball bush, lilac, roses, russian olive, cherry, linden, spirea, yew, potentilla, privet, pyramid cedar, mockorange, globe cedar, hydrangea, forsythia, honeysuckle, Mountbatten juniper, Golden Pfitzer juniper, apple, Bartlett pear, white spruce and Skyrocket juniper. Observations on weed control and crop tolerance were made on September 1.

RESULT: All rates of Surflan tested; 0.55, 1.80, 2.70 and 3.02 kg/ha active ingredient (a.i.) gave 80% control of weeds compared to an untreated check. Surflan/Princep at 1.30 + 0.40 kg/ha a.i also gave 80% control. Princep alone at 0.40 kg/ha a.i. gave 40% control. Surflan controlled all weeds except clover, yellow evening primrose and horsetail which were easily controlled by spot treatment with Roundup. The untreated check plot was infested with a wide range of annual grasses and broadleaf weeds.

CONCLUSION: Surflan when registered should enable ornamental growers to effectively control annual weeds in shrubs and trees.

EVALUATION OF ASPARAGUS CULTIVARS

BY

EMERY BERNARD

Abstract: The first harvest information from ten asparagus cultivars established in 1980 at the New Brunswick Horticulture Center was obtained in 1982. The Rutgers strains out performed other strains in total yield and percent marketable and as well, recorded low levels of rust infestation.

INTRODUCTION: This cultivar evaluation is part of a national asparagus research program under the direction of Dr. H. T. Tiessen of the University of Guelph which is being funded through the new Crop Development Program. This program is, in large, geared to variety evaluation and improvement, but also will undertake to evaluate various cultural practices and nutritive requirements.

METHODS: Seeds of ten (10) different cultivars were seeded in the greenhouse in the spring of 1980 and field transplanted in June of 1980 at the New Brunswick Horticulture Center. The trial was established in a loamy sand soil in a randomized block design.

The cultivars under evaluation were,

Viking 2K
Lucullus Early
Lucullus Mid-Season
Diane (Double Hybrid)
W.S.U. Hybrid #1

U. California 66 Moxee
U. California 66 Fus. Res.
Martha Washington (Old Ben Smith)
56x14-MM (Rutgers)
Rutgers 56x14-4

Weed control was carried out by hand again this year in case herbicides would interfer with cultivar performance. From the vigorous growth during 1981, it was decided to allow five harvests in 1982. Plots were harvested every second day in the period from May 12 to May 21.

The evaluation of cultivars was based on percent crown survival, yield of spears, percent marketable and the degree of rust infection in the fall.

TABLE I. PERFORMANCE OF THREE YEAR OLD ASPARAGUS CULTIVARS, 1982.

Cultivar	% Survival (crowns)	Total Yield of Spears (g)	% Marketable Spears	% Rust Infection
Rutgers 56x14-4	96	1694	59	0
Rutgers 56x14-MM	85	1633	44	15
Lucullus Mid-Season	87	1331	31	0
W.S.U. Hybrid #1	89	1302	42	50
U. California Moxee 66	84	1282	37	50
U. California Fus. Res. 66	87	1046	44	50
Lucullus Early	85	970	31	20
Martha Washington (Old Ben Smith)	77	950	26	30
Diane	79	845	18	50
Viking 2K	80	653	27	40

RESULTS AND DISCUSSION: Survival and growth of all cultivars has been good. In the ten-day harvest period in 1982, the Rutgers University selections out yielded all other named cultivars (Table I). These selections also had the highest percentage of marketable spears. Marketable spears being those spears 15-18 cm in length.

When evaluated for asparagus rust in late summer, the percentage of infected fronds varied from 0-50% with the three top yielding cultivars having the lowest levels of infestation.

The first complete harvest lasting six weeks will begin in 1983.

REFERENCES: Cormier, R. 1980. Evaluation of Asparagus Cultivars. Adaptive Research Report. New Brunswick Department of Agriculture and Rural Development. p. 121-122.

REDUCED TILLAGE TECHNOLOGY FOR VEGETABLE CROPS TO MINIMIZE SOIL EROSION*

BY

KAREL MICHALICA, DOUGLAS DOOHAN, EMERY BERNARD,
DAVID McKINNEY

Abstract: The yield of snap beans and tomatoes were comparable for both zero and conventional tillage. Sweet corn under strip tillage outyield crop under conventional tillage by 56%. Seeding directly into cover crop resulted in decrease of sweet corn yield by 81%. The yield of cauliflower was lower under no tillage in comparison to the conventional one. Soil moisture content (0-5 cm below soil surface) was found up to 5% higher under no tillage treatment.

INTRODUCTION: During 1982 (first cropping season of the technology evaluation), the tillage technologies were evaluated in terms of crop yields and soil properties. In the following year, the most promising combinations of tillage technologies, cover crops and herbicides will be tested further.

Soil erosion resistance as affected by various cover crops could not be evaluated in 1982 since there was no flood occurence over the test plots.

MATERIALS AND METHODS: The cover crops tested were as follows: fall rye, lawn mixture (40% Kentucky Blue, 40% Creeping Resue, 20% annual ryegrass) and red clover. Four vegetable crops selected for evaluation were: sweet corn (Harmony), snap beans (Provider), tomatoes (Ultra Girl) and cauliflower (Early Summer). Tillage treatments were: no tillage, strip tillage (25 cm wide, garden roto-tiller) and conventional tillage.

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*Financially supported by Technology Transfer Program, ASA II.

Gramoxone (1.1 kg/ha) and Roundup (2 kg/ha) were used to control cover crops, Atrazine (1 kg/ha), Endine (5 kg/ha), Sencor (0.5 kg/ha) and Dacthal (6 kg/ha) were used to control weeds. The standard recommendation practices were followed for each tested crop.

Soil of the test plot was Interval silt loam, pH ranged from 5.8 to 6.5 and had medium to high level of all major nutrients with the exception of magnesium which was in low supply.

Seeding of corn and beans was done on all treatments by John Deere Max-Emerge 7000 Direct Seeder on May 21. Transplanting of tomatoes and cauliflowers was done manually on June 17th.

Conventional tillage and strip tillage were done by roto-tiller, both the depth of tilling and the width of strips were 25 cm. The recommended fertilization practices were followed uniformly throughout test plots.

Soil temperature at the depth of 10 cm was measured by using diods on 15 locations throughout the plots. Gravimetric soil water content for the depth of 0-5 cm was determined for each plot several times throughout the growing season.

Soil density and compaction were measured by sampling "undisturbed" soil cores (7.5 cm diameter) and by application of a pocket penetrometer (Soil Test).

The site of a harvested plot was approximately 20 m^2.

RESULTS AND DISCUSSION: All cover crops survived winter well. The rye and sod were infested by snow mold which suppressed their early regrowth. As there was no flood occurence at the test plots in the 1982 the ability of cover crops to prevent or retard soil erosion could not be evaluated.

The germination and initial growth of corn was not uniform.

Atrazine controlled effectively weeds but did not control growth of cover crops. Both Gramoxone and Roundup were effective in that aspect. Afesin provided effective control of broadleaf weeks and annual grasses.

Enide provided an excellent control of weeks in tomatoes (90%), Sencor and Dacthal provided satisfactory control, 60 and 70% respectively.

The yields of sweet corn grown under various tillage technologies are presented in Table I. The strip tillage had the most positive effect on yield (up by 56% in comparison with the conventional tillage). The combination of strip tillage and red clover outyielded the conventional tillage by 93%. The yield of corn directly seeded into corn crop depressed the yield in comparison to conventional tillage by 69%. Corn matured earlier under conventional and strip tillage in comparison to no tillage (Table II).

There was no significant difference in maturity and yield of corn as affected by the cover crops grown under no tillage system (Table III).

There was no significant difference found in the yield of tomatoes produced under either tillage technology. Sidedressed fertilizer treatment produced better yield in comparison with broadcasted practice (Table IV).

Yield of cauliflower (both number and size) was higher under the conventional tillage. The yield difference between sidedressed and broadcasted fertilizer treatments was not significant (Table V).

Yield of snap beans was higher under no tillage technology in comparison to conventional tillage. There seemed to be inverted relationship between plant height, leaf length and yield of pods (Table VI). Excessive heights of a cover crop induced tall and spindly growth which reduced leaf size and in turn negatively affected yields.

During prolonged period without a precipitation, soil gravimetric moisture content in the depth of 0-5 cm was found up to 5% higher in no tilled plots in comparison with conventionally tilled ones.

Soil temperatures in 10 cm depth varied up to 4°C among plots but no consistant relationship was found among various treatments.

Soil penetrometer readings ranged from .7 to 1.6 kg cm^{-3} in corn and from 1.0 to 3.0 kg cm^{-3} in tomatoes. Bulk density measured in corn plots ranged from .99 to 1.13 gm cm^{-3}.

TABLE I. THE EFFECT OF VARIOUS TILLAGE TECHNOLOGIES
ON YIELD OF SWEET CORN (DOZEN OF COBS/HA)

Technology	Surface Cover				Mean
	Sod	Winter Rye	No Cover	Red Clover	
No-Tillage Totally Killed Cover	1,973	1,893	2,391	3,766	2,506
No-Tillage Strip Killed Cover	3,446	3,355	3,332	1,529	2,915
Strip Tillage	2,874	7,798	10,486	9,501	7,665
Conventional Tillage	5,774	5,569	3,743	4,587	4,918

TABLE II. THE EFFECT OF VARIOUS TILLAGE TECHNOLOGIES ON MATURITY OF SWEET CORN

Technology	Surface Cover	Maturity % Aug. 30	 Sept. 3	 Sept.10
No-Tillage Totally Killed Cover	Sod	8	27	65
	Winter Rye	3	20	77
	No Cover	0	18	82
	Red Clover	0	23	77
Mean		3	22	75
No-Tillage Strip Killed Cover	Sod	0	29	71
	Winter Rye	0	25	75
	No Cover	0	25	75
	Red Clover	0	22	78
Mean		0	25	75
Strip Tillage	Sod	0	36	64
	Winter Rye	24	34	42
	No Cover	21	34	45
	Red Clover	22	34	44
Mean		17	35	49
Conventional Tillage	Sod	16	33	51
	Winter Rye	19	32	50
	No Cover	15	32	53
	Red Clover	17	32	51
Mean		17	32	51

TABLE III. THE EFFECT OF COVER CROP ON YIELD AND MATURITY OF SWEET CORN (NO-TILLAGE TECHNOLOGIES COMBINED)

Cover Crop	Maturity % Aug. 30	 Sept. 3	 Sept. 10	Yield Dozen of Cobs/ha
Sod	4	28	68	2,710
Winter Rye	2	22	76	2,624
Red Clover	0	22	78	2,648

TABLE IV. THE EFFECT OF TILLAGE TECHNOLOGY ON YIELD OF TOMATOES

Technology and Herbicide Treatment		Yield (T/ha)
No Tillage (Winter Rye)	Gramoxone	10.2
	Roundup	9.3
Conventional Tillage	Sidedressed (surface)	11.6
	Broadcasted (incorporated)	6.0

TABLE V. THE EFFECT OF TILLAGE TECHNOLOGY ON YIELD OF CAULIFLOWER

Technology and Herbicide Treatment		Yield (Number of Heads) Per Hectare
No Tillage (Winter Rye)	Gramoxone	11,250
	Roundup	12,200
Conventional Tillage	Sidedressed (Surface)	16,221
	Broadcasted (incorporated)	16,744

TABLE VI. THE EFFECT OF TILLAGE TECHNOLOGY ON GROWTH AND YIELD OF SNAP BEANS

Technology and Herbicide Treatment		Plant Height June 16 (cm)	Leaf Length June 16 (cm)	Yield of Pods (T/ha)
No Tillage (Winter Rye)	Gramoxone	8.0	5.4	18.8
	Roundup	6.4	5.6	20.1
Conventional Tillage		7.3	4.8	15.9

In general, conventionally tilled plots were less dense and looser in comparison to no tilled ones. The variability of data did not allow detail analysis.

The higher soil density affected negatively the yield of sweet corn. The fluctuation of moisture content among the treatments did not affect the yields under given soil and climate conditions.

ACKNOWLEDGEMENT: The assistance of Dr. Lien Chow, Agriculture Canada, and Mr. Charles Everett, Engineering Branch, N. B. Department of Agriculture, Carol Grove and Ralph Simpson during field investigations was appreciated.

REFERENCES: Cormier, Renald. et al. No Tillage Technology for Vegetable Crops to Minimize Erosion, Progress Report, 1981.

Mascianica, H. P. et al. Tillage Systems in Corn Production. The Vegetable Growers News, Volume 36, No. 9, March, 1982.

Tessore, C. et al. 1982. No-Till Farm Vegetable Experiments. The Vegetable Growers News, Volume 36, No. 9, March, 1982.

Wilson, H. P. 1982. No Tillage Production of Snap Beans. The Vegetable Growers News, Volume 36, No. 9, March, 1982.

THE EFFECT OF ANTI-CRUSTANTS ON CARROT EMERGENCE AND YIELD

BY

KAREL MICHALICA

Abstract: Sawdust was the most effective of four tested anti-crustants, it increased emergence of carrots up to 57%, yield of Canada #1 by 73.1% and the total yield by 34% over the control. Super slurper and gypsum increased yield of Canada #1 up to 41.4% and 27.6% and total yield up to 12.2% and 2.6% respectively. Other anti-crustants were found ineffective. Even when the crust was not formed, sawdust increased emergence, yield of #1 and total yield up to 10.8%, 18.9% and 11.3% respectively.

INTRODUCTION: The anti-crustants that have proven to be the most effective during 1981 were tested along with two new additions. As the carrots emerged on the established plot (#1) before a soil crust had formed, an additional plot (#2) was established.

MATERIALS AND METHODS: The test plots were established on Interval silty loam soil well supplied with all major nutrients, pH ranged from 6.7 to 7.0.

The anti-crustants tested were as follows: sawdust, gypsum (fine grade), Super slurper[1], Aqua-gro "L"[2] and Vi-Grow[3].

The soil was prepared by a roto-tiller to a depth of 30 cm. Carrots were seeded into raised beds (183 cm wide) in three bands 45 cm apart. The anti-crustants were placed or sprayed on approximately a 10 cm wide strip over the middle row and (including control) lightly packed by rakes.

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[1] Super slurper, a starch polymer, Henkel Co.

[2] Aqua-gro "L", a soil wetting agent, Aquatrols Corporation of America.

[3] Vi-Grow, a cellulose xanthate, Cortlaulds (Canada) Inc.

RESULTS AND DISCUSSION: Table I shows the emergence and yield of carrots in plot #1 (crust was not formed). The deviations of emergence and yield in comparison with the control were, with the exception of sawdust, reflecting mainly experimental variability. Sawdust increased emergence (up to 10.8%), yield of Canada #1 carrots (up to 18.9%) and total yield (up to 11.3%). This increase may be attributed to the moderating effect of sawdust on soil moisture and temperature fluctuations.

Even though gypsum (fine grade) depressed the emergence, the yield of Canada #1 carrots was increased (Table I). There is a positive effect of either calcium or sulfur on size and shape of the carrot roots.

Carrot emergence and yield was significantly affected by amendments on plot #2 where crust was formed (Table II). Sawdust and Super slurper have increased the emergence by 66.7 and 92.8% in the first count and 62.8 and 31.0% in the second count respectively. Sawdust amendment resulted in the highest increase in the yield of Canada #1 carrots (73.1%) followed by Super slurper (41.4%). The highest increase of the total yield of 34.3% resulted by adding sawdust, the increase by Super slurper was 12.2%. Gypsum increased significantly the yield of Canada #1 carrots (27.8%) but the increase of the total yield was only 2.6%. (The small increase in the total yield can be explained by depressed emergence linked to the negative effect of fine grade gypsum on soil physical conditions.

CONCLUSIONS AND RECOMMENDATIONS: The increases in both Canada #1 and total yield by sawdust were the highest from all amendments and consistent with the results obtained in 1981. The increases obtained by adding Super slurper and gypsum were significantly smaller.

When one compares the cost of the amendment per hectare, sawdust costs approximately $10 while Super slurper costs $1,200. The sawdust is then not only the most effective but also by far the most economical amendment from those tested in 1981 and 1982. Also, the positive long-term effect of sawdust on soil physical and chemical properties should not be overlooked.

The missing linkage between the tested results and its practical application is the development of mechanization that would enable the transfer and placement of sawdust above the seed row during the seeding operation. The assistance for development of appropriate technology will be sought from the existing Technology Transfer Program.

TABLE I. Emergence and Yield of Carrots as Affected by Various Anti-Crustants.

(Plot #1, Crust Not Formed.)

TREATMENT	Amount per ha (strip width 10 cm)	Emergence (Middle row, length 10 m)	Deviation from control %	Yield Canada #1 t/ha	Deviation from control %	Total Yield t/ha	Deviation from control %
Control	-	780	-	43.8	-	62.0	-
Sawdust	3 m^3	825	+ 5.8	45.5	+ 4.6	62.0	-
Sawdust	5 m^3	798	+ 2.3	51.2	+16.9	64.5	+ 4.0
Sawdust	10 m^3	864	+10.8	52.1	+18.9	70.3	+11.3
Super slurper	60 kg	797	+ 2.2	43.0	- 1.8	60.3	- 2.7
Super slurper	120 kg	879	+12.7	49.6	+13.2	62.8	+ 1.3
Super slurper	180 kg	824	+ 5.6	38.0	-13.2	59.5	- 4.0
Vi-grow	25 l	801	+ 2.7	38.8	-11.4	54.5	-12.1
Vi-grow	50 l	625	-19.9	45.5	+ 3.9	62.0	-
Aqua-gro "L"	16.5 l	810	+ 3.8	48.8	+11.4	60.3	- 2.7
Aqua-gro "L"	41.3 l	823	+ 5.5	44.6	+ 1.8	56.2	- 9.5
Aqua-gro "L"	82.6 l	852	+ 9.2	44.6	+ 1.8	62.0	-
Gypsum	1 T	747	- 4.2	49.6	+13.2	64.5	+ 4.0
Gypsum	2 T	623	-20.1	48.8	+11.4	61.2	- 1.3
Gypsum	3 T	713	- 8.6	44.6	+ 1.8	57.9	- 6.4

TABLE II. Emergence and Yield of Carrots as Affected by Various Anti-Crustants.

(Plot #2, Crust Formed.)

	Amount per ha (strip width 10 cm)	Emergence (Middle row, length 10 m)		Deviation from control %		Yield Canada #1 t/ha	Deviation from control %	Total Yield t/ha	Deviation from control %
		1st count	2nd count	1st count	2nd count				
Control	-	276	258	-	-	14.5	-	27.1	-
Sawdust	5 m^3	460	420	+66.7	+62.8	25.1	+73.1	36.4	+34.3
Super slurper	120 kg	532	338	+92.8	+31.0	20.5	+41.4	30.4	+12.2
Gypsum	2 T	254	248	- 8.0	- 3.9	17.2	+18.6	27.8	+ 2.6
Aqua-grow "L"	41.3 l	284	284	+ 2.9	+10.1	18.5	+27.6	28.4	+ 4.8
Aqua-grow "L"	82.6 l	298	229	+ 8.0	-11.2	15.2	+ 4.8	25.8	- 4.8

ACKNOWLEDGEMENTS: The co-operation of growers Gerald and Harry Buyting and the assistance of Dr. Lien Chow and Mr. Ralph Simpson were greatly appreciated.

REFERENCES: A New Defence for the Fine Crumb, 1980. Supplement to Grower, November 27.

Canadian Agricultural Products Standard Act, 1977. p. 84-88.

Michalica, K. T. V. et al. 1981. Evaluation of the Effects of Anti-Crustants on Carrot Emergence and Yield. Progress Report, p. 101-105, Adaptive Research Reports. N. B. Department of Agriculture and Rural Development.

Saini, G. R. 1982. Personal communications.

GREENHOUSE TOMATO MEDIA TRIAL*

BY

A. W. CURRIE AND P. FINNIGAN

Abstract: A late spring crop of Vendor greenhouse tomatoes was grown in six media types, each of them consisting of peat, sawdust or a mixture of both. Maximum yields were found in the five-year old peat and the one-year old sawdust mixture. The highest quality fruit was found in the new sawdust mixture.

INTRODUCTION: Various media have been used throughout the world for greenhouse tomatoes. Its reliability and quality are very important in supplying adequate nutrient exchange and moisture. Price and supply is a major factor. Peat and sawdust are two very available and inexpensive media. Both have proven effective as high quality growing materials.

MATERIALS AND METHODS: A mixture of five-year old peat and one-year old sawdust both previously used to grow tomatoes was used as one type of medium. The media trial in all six cases used 2.3 m^3 of material.

For the old peat and sawdust, a fertilizer mix was incorporated before the wooden beds were to be filled. It consisted of .68 kg iron sulphate, 1.36 kg of super phosphate, 1.8 kg of gypsum, 170 gms of fritted trace elements, 30.2 and 28.35 gms of iron chelate. This resulted in a pH of 6.0 and conductivity of 76 mhos 10^{-5}.

A second medium consisted of used steamed peat. It was amended before planting with 2.05 kg of 0-20-0, .9 kg of gypsum, 283.5 gms of F.T.E. 302 and 28.35 gms iron chelate. The resulting pH was 5.9 and the conductivity was 68.

The third medium used was the one-year old sawdust. It was amended before planting with .68 kg or iron sulphate, 1.36 kg of 0-20-0, 1.8 kg of gypsum, 170.1 gms of F.T.E. 302, and 28.35 gms of iron chelate. The resulting pH was 6.0 and conductivity was 76.

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*Partially funded by the Technology Transfer Program, A.S.A. II.

Medium four was comprised of 50% new peat and 50% new sawdust. It was amended with 4.3 kg of 0-20-0, 18 kg of Dolomitic limestone, 2.0 kg $CaNO_4$, 85 gms of iron chelate, .9 kg of gypsum and 283.5 gms of F.T.E. 302. The resulting pH was 6.2 and salts were 101.

Medium five was 100% new peat moss. To it, before planting, the following were added: 22.7 kgs. Dolomitic limestone, .9 kg gypsum, 3.18 kg 0-20-0, 85 gms iron chelate, 2.0 kg $CaNO_4$ and 283.5 gms of F.T.E. 302. The resulting pH was 5.7 and conductivity was 81.

Medium six was 100% new sawdust. To it was added .70 kgs of iron sulphate, 5.9 kgs 0-20-0, 1.8 kgs gypsum, 170 gms F.T.E. 302 and 85.0 gms iron chelate. The resulting pH was 5.3 and conductivity was 85.

Each bed was filled, drip irrigation was laid and the transplants were placed in the beds. A constant feeding program was followed throughout the trial. It was adjusted according to bi-weekly tissue analysis.

RESULTS:

TABLE I. GREENHOUSE TOMATO MEDIA TRIAL

Media	Total Yield (kgs)	% #1*	% #2
50% 5 yr. old peat 50% 1 yr. old sawdust	435.9	79.0	21.0
Used peat steamed	429.6	72.2	27.8
1 yr. old sawdust	411.1	80.7	19.3
50% new peat 50% new sawdust	408.9	79.8	20.2
New peat	384.0	78.0	22.0
New sawdust	252.2	82.6	17.4

*Represents the percentage of fruit that meets the Canada #1 grade for tomatoes.

DISCUSSION: From the harvested fruit, definite yield patterns developed. Table I fully illustrates the yields and fruit quality. The old peat and sawdust mixture gave the best yields. This was probably due to the stability of the mixture.

Any combination of peat and sawdust outperformed peat or sawdust alone. The sawdust media generated the best overall percentage of #1 fruit. The sawdust media plants were generally smaller with less foliage and smaller clusters. This is one reason why the quality was higher. Peat moss alone was superior to its counterpart of sawdust in both the old and new sawdust cases. New sawdust was often dry and low in nutrients. More frequent watering was necessary for it alone.

CONCLUSION: Peat and sawdust is an excellent growing medium. It is relatively inexpensive and readily available in New Brunswick. Once the medium has been allowed to age, it forms a more consistent growing medium. The pore spaces and moisture holding capacities are vastly improved by using a peat plus sawdust mixture. Sawdust in any mixture in this trial has improved fruit quality and thus overall returns per kilogram. Greenhouse vegetable growers should seriously consider a peat-sawdust mixture in their growing program.

BIOLOGICAL CONTROL OF WHITEFLY AND SPIDERMITES IN GREENHOUSES*

BY

ANDREW CURRIE AND DAVID FINNAMORE

Abstract: Greenhouse tomatoes infected with whitefly and greenhouse cucumbers infested with spidermites were treated with an introduction of parasitic wasps and predatory mites respectively. The cucumber plants were eventually freed of two spotted spidermites. The life of the crop was extended by the lack of mites. The tomato crop experienced low populations of parasites during cooler months. September saw a dramatic increase in the overall numbers of whiteflies due to a decrease in parasites.

INTRODUCTION: Control of the greenhouse whitefly, *Trialeurodes vaporariorum*, and the two-spotted spidermite, *Tetranychus urticae*, has proven difficult to obtain with many pesticide programs. By utilizing the parasitic wasp, *Encarsia formosa*, to control whitefly and the predatory mite, *Phytoseiulus persimilis*, to control spidermites, a dramatic decline in pesticide usage may be achieved.

This trial was initiated in an attempt to demonstrate the effectiveness of this type of control. A greenhouse in Rogersville having a major problem with spidermites, and one in Salisbury having major problems with whiteflies, were selected as trial sites.

MATERIALS AND METHODS: On the selected sites, populations of predatory mites and parasitic wasps were introduced early in the life of the young seedlings. The populations were distributed randomly throughout the greenhouse so as to encourage the spread and successful distribution of the controlling mites and wasps.

In the case of the predatory mites, this was a single introduction. The wasps were reintroduced at two-week intervals. The rates of introduction was two predatory mites per cucumber plant when it was slightly infested. The tomatoes had wasps introduced at one wasp per plant. This occurred when the whitefly population was one per every five plants or less.

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*Funded by the Technology Transfer Program, ASA II.

RESULTS: The cucumber crop was in culture during the warmest periods of the year. This gave the predatory mites the best temperatures possible (21-27°C) for reproduction. This enabled the predators to completely overtake the indigineous population of two-spotted spidermites. The pest population collapsed giving the producer a longer, more productive season than he had experienced before.

In the case of the whiteflies, the parasitic wasp requires temperatures greater than 22°C in order to overcome the whitefly host. Control was evident throughout the summer months, however in early fall, the cooler growing temperatures and lack of sunshine saw a general fall in the parasite population. This lead to an excess in whitefly on parts of the crop.

CONCLUSIONS: Biological control of whitefly and two spotted spidermites is feasible and adequately controls the pests under the above-mentioned conditions. Success will be achieved if introduction is timed properly, and if the overall temperatures are met around the crop. The parasites will systematically overcome the pest problem.

Reintroductions may be necessary to insure that sufficient predatory mites as well as wasps are present. Therefore, a static population of pests must be tolerated to give an adequate food supply for the controlling organisms.

The predatory mites and parasitic wasps are available from Better Yield Insects, 13310 Riverside Drive East, Tecumseh, Ontario. 10,000 whitefly parasites cost $40.00, 1,000 spidermite predators cost $70.00.

TOMATO YIELD RESPONSE, UNDER PLASTIC MULCH TO NITROGEN FERTILIZER

BY

R. CORMIER, I. GHANEM, E. BERNARD AND R. BUCHANAN

Abstract: The use of plastic mulch in vegetable production has been introduced to New Brunswick in the last four years. In 1982, evaluation of tomato yield response to various rates of nitrogen application has been carried out, and 40-56 kg nitrogen/ha was found to be adequate for tomato production under black plastic mulch.

INTRODUCTION: Previous studies on the use of plastic mulch in vegetable production have indicated that plastic mulch would reduce the leaching of soluble nutrients added as fertilizer. Thus these nutrients stay in the available form for a longer period of the growning season. It is of importance to know what the optimum rate of application of nitrogen fertilizer under plastic mulch is.

The lower rate of fertilizer will affect the cost of production under plastic mulch. In 1981, evaluation of tomato yield response under no mulch and mulched conditions, showed that mulching will give a substantially higher yield (30%).

MATERIALS AND METHODS: The trial was carried out on a silty loam soil, interval land in the Sheffield area. The soil had a pH of 6.7 with a high rating for phosphorus and calcium, and a medium rating for potassium and magnesium. Prior to nitrogen application, (5-20-20) fertilizer was broadcasted over the trial area at a rate of 672.5 kg/ha. Nitrogen was applied and tilled in, to bring the final levels of nitrogen to 40, 56, 78 and 101 kg/ha, in the respective treatment rows.

Each treatment was replicated three times and yield response to nitrogen rates was evaluated under black plastic mulch.

The transplants, of the Scotia variety, were 5 1/2 weeks old, at the time of planting, and were transplanted on June 10, 1982.

A starter solution of 10-52-17 was applied to the young transplants prior to transplanting.

The transplants were placed at 0.6 meters in the row and on 1.6 meter row canters. A recommended fungicide spray program was followed throughout the growing season.

Soil and tissue samples were collected on July 19 and August 19, 1982, to monitor the levels of nutrients in both soil and plant tissue.

Harvest commenced on August 3, 1982 and ended on September 22, 1982, each harvest was graded, counted, weighed and recorded (Table I).

RESULTS AND DISCUSSION: The earliest maturity date as expressed by the August 18 harvest was obtained at the low level of nitrogen application (40 and 56 kg/ha). The cumulative total yield at September 22 harvest, indicates that 40 kg N/ha gives the optimum yield. Higher levels of nitrogen application did not increase the yield substantially.

TABLE I. CUMULATIVE YIELD DATA - AVERAGED FIGURES 1982 RESULTS, MARKETABLE YIELD KG/HA (CANADA #1 AND CANADA #2)

	Random Harvest Dates			
Treatments	Aug. 18	Sept. 3	Sept. 13	Sept. 22
40 kg/ha Nitrogen	1854.2	4697.9	15114.6	41291.7
56 kg/ha Nitrogen	1875.0	4718.7	14510.4	36770.8
78 kg/ha Nitrogen	1270.8	3583.3	12885.4	40807.3
101 kg/ha Nitrogen	958.3	4312.5	14343.7	44593.7

In the 1981 experiment, the optimum yield was obtained at the 56 kg N/ha application rate. The saving due to the low rate of nitrogen application would pay for part of the cost of plastic mulch thus making the economics of tomato production under plastic mulch more attractive.

CONCLUSION: Under plastic mulch 40-56 kg nitrogen per hectare produces the optimum and earliest tomato yield. Saving of approximately 50 kg N/ha can be used to offset part of the cost of plastic.

REFERENCES: Jones, T. L., Jones U. S., 1977. Effect of Nitrogen and Plastic Mulch on Properties of Troup Loamy Sand and on Yield of 'Walter Tomatoes'. J. Amer. Soc. Hort. Sci. 102(3)" 273-275. 1977.

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QUALITY OF PLASTICS FOR MULCHING

By

E. BERNARD

Abstract: Three types of plastic films were tested for suitability as mulching material for vegetable crops, 1) embossed, 2) virgin and 3) reconstituted polyethylene. The reconstituted film was unacceptable, the virgin film was adequate with some removal problems, and the embossed was very desirable with excellent strength characteristics at removal time.

INTRODUCTION: The market for agricultural plastic films has become a competitive one with a number of products of varying quality and composition available to the user. In 1982, three of these products were tested for suitability on vegetable crops in N.B.

The products included virgin polyethylene film (from Poly Cello Ltd.), which is the traditional product used for vegetable mulches, a "reconstituted" polyethylene film (from Poly Cello Ltd.) and an "embossed" plastic film from Ethyl Corporation, Visqueen Film Products Div, Virginia. Both black and clear formulations of the virgin and embossed types were tested.

METHODS: The three black films were tested at Harrison Farms, Maugerville. The plastic was laid on raised beds. Peppers were transplanted through the film in two alteranting rows per bed. The film was observed through out the summer and evaluated in the fall for ease of removal from the field.

The clear film was tested on direct seeded beans and corn. The plastic was left on the rows for five weeks.

RESULTS AND DISCUSSION: Black films - By mid-July the "reconstituted" film was starting to tear around the plant bases and by November was highly segmented, brittle and very difficult to remove. The "virgin" film remained in one piece throughout the season, but was very brittle and easily split by November making removal slow. The "embossed" film did not break down like the other two. By November, this film appeared to be as strong as it had been in the Spring. Clearly it had more tear strength in November than the "virgin" and "reconstituted" films had when new.

The "embossed" film definitely had superior strength and durability. However, the benefits in ease of removal must be weighed against the considerably higher price (due to duties and sale taxes, and the exchange of Canadian funds to American) for the embossed film. The additional strength of the product could simplify the development of a mechanical means for mulch removal. In addition this product may prove valuable on perennial crops such as strawberries.

The "reconstituted" film was unacceptable for a full season crop. The standard "virgin" film was adequate but does create some removal problems due to splitting.

Clear films. At removal time, both films performed satisfactorily and no differences on crop growth were observed. The "embossed" had retained its full strength. Because of the short duration of use, it is doubtful if the more expense "embossed" film could be justified unless a method for removal and reuse of film can be developed.

PLUG MIX SEEDING OF PICKLING CUCUMBERS

BY

EMERY BERNARD

Abstract: A plug mix planter was evaluated in 1982 for seeding pickling cucumbers through plastic mulch. Various plug mix media and seeding rates were tested. Both a peat medium and peat-sand medium produced adequate plant stands. The peat-sand mix suited the existing planter better than the peat mix. The plant stand from plug-mix planting was not as uniform as hand planting.

INTRODUCTION: Plug mix planting is a method whereby seed, fertilizer and a germinating medium such as peat moss are mixed together (Table I). Then, at each planting location, a plug of this mixture is mechanically planted either into bare ground or through a plastic mulch.

In 1980, a plug mix planter/transplanter designed to both seed and transplant through plastic mulch was obtained for evaluation in New Brunswick under the ASA II, Technology Transfer Program (Cormier, 1980). In 1980, the machine was successfully demonstrated as a means to transplant seedlings through mulch. However, the plug mix seeding of large seeded crops such as cucumbers and squash was less satisfactory.

In 1982, the plug mix seeder was again evaluated using various seeding rates and various plug mix media. Because of an increase in pickling cucumber acreage in New Brunswick and because of the desire on the part of the producers to utilize mulching for pickling cucumbers, the evaluation of the planter was carried out with this crop.

METHODS: The plug mix planter was evaluated in 1982 at the New Brunswick Horticulture Centre, Hoyt, and on the farm of Eloi Richard, Rexton, on one hectare of pickling cucumbers. Seeding rates of 1.3 kg/ha to 4.0 kg/ha were tested. Plug mixes consisted of peat moss, peat and sand (50:50 by volume) and sand. All mixes also contained fertilizer, lime and minor elements.

RESULTS: Peat - Peat moss has been the standard medium for plug mix planting. However, problems exist with the uniform flow of this medium through the hopper to the planting cups. The machine must be continuously assisted by a person on the planter to ensure adequate filling of the cups. One method to resolve this problem was to by-pass the hopper and to hand-fill the cups with the plug mix.

The peat moss medium had to be wet slightly to ensure good germination. The most satisfactory peat moss plug mix contained 4.0 kg of seed in 48 kg of peat medium per hectare.

Even with the problems associated with the filling of planting cups, the peat moss medium produced the best stand of cucumbers with the least damping off.

Sand-Peat - After the seeds were mixed with the peat and fertilizers, an equivalent volume of sand was added. This mix resulted in a more even flow with less assistance required. With a rate of 1.5 kg of seed per hectare, plant density was satisfactory.

Sand - With this medium, a source of stone-free sand was required. Considerable wastage of this free-flowing medium occurred resulting in a large weight and volume of medium being required (1200 kg/ha). It was also difficult to obtain a good mix of seed and sand. The resulting stand was more variable with a higher rate of damping off.

DISCUSSION: Both the peat medium and the peat-sand medium produced adequate plant stands. The peat medium which was the superior mix for germination and early seedling growth caused more problems in the seeding operation.

Neither plug mix produced a stand as uniform as hand planting.

With the plug mix planter, seeding through plastic can be carried out utilizing a two-person operation. Care and time must be taken to obtain a suitable mixture of seed and medium to ensure a uniform seeding rate and an adequate plant stand.

REFERENCES: Cormier, R. and E. Bernard, 1980. Evaluation of Mulch and Plug Transplanter Equipment. Adaptive Research Reports. Department of Agriculture and Rural Development. 1980. p. 94-95.

TABLE I. PLUG MIX MEDIUM USING SPHAGNUM PEAT

Components	Per cu Metre
Sphagnum Peat	3 bales (6 cu. ft. bales)
Dolomitic Lime	6.8 kg
Chelated Trace Elements	2 Tb
15-30-15 (Soluble)	1 Kg

MONITORING MOTH FLIGHTS OF CORN INSECTS USING BLACK LIGHT INSECT TRAPS*

BY

D. B. FINNAMORE

Abstract: Five black light insect traps were placed in different corn growing areas of the Province to monitor moth flights of the European corn borer and corn earworm.

INTRODUCTION: This project was undertaken to evaluate the use of a black light insect trap to monitor adult activity of two major corn insects, the European corn borer and the corn earworm. These two insects are major pests of sweet corn and growers have to apply insecticides to control them. If flight periods of the adult moths could be determined in a practical manner, growers would be alerted to such periods and the application of insecticide sprays could be timed more precisely. If no adult moths were captured, then it would not be necessary to apply insecticides, thus lowering the cost of sweet corn production and reducing the insecticide impact on the environment.

METHODS: Five, Ellisco, General Purpose 15-Watt "Black Light" Insect Traps were purchased to monitor moth flights of European corn borers and corn earworms. The traps were placed at five locations and individuals were found to tend the traps and empty the nightly moth catches each day.

The daily catches were placed in a mailing container and each catch was separated by a layer of cotton wool. The container was mailed weekly or as soon as it became full with moths, to Dr. H. Specht, Canada Agriculture, Research Station, Kentville, N. S., where the moths were identified.

Light traps were placed on the farms of Mr. K. Harvey, Maugerville, Sunbury Co.; Mr. A. McDonald, MacDonalds Point, Queens Co.; Mr. R. Pope, Belleisle Creek, Kings Co.; the New Brunswick Department of Agriculture and Rural Development Horticultural Center, Hoyt, Sunbury Co.;and the C.D.A. Senator Michaud Experimental Station, Kent Co. Traps were operated from early May until the last week in August.

*Financially supported by Technology Transfer Program, ASA II.

RESULTS: The black light traps were very effective in collecting large numbers of different night flying species of moths.

DISCUSSION: Although the black light traps were very efficient in collecting large numbers of different species of moths. When the collected moths were sent via mail to Dr. Specht at Kentville, N. S., the large numbers of moths would heat and many arrived in such an advanced state of decomposition as to be unidentifible. There was also too great a time lost before the moths reached N. S. and were identified. The information on the activity of adult moths was obtained too late to time insecticide sprays for corn insect control.

An alternate method of holding the catches from the traps and identifying the moths quickly must be found if this method of timing sprays is to become useful.

WEED CONTROL FOR VEGETABLES GROWN WITH PLASTIC MULCH*

BY

D. J. DOOHAN, R. C. CORMIER, E. BERNARD

Abstract: Weed control methods were evaluated and recommendations made for weed control under plasticulture techniques.

INTRODUCTION: A research program initiated in 1981 (Doohan et al, 1981) was continued. Weed control systems were evaluated for sweet corn, snap beans, cucumbers, squash, tomatoes and cantaloupe under plastic mulch. In addition, recommended herbicides were tested for control of weeds growing between the rows of plastic mulch.

MATERIALS AND METHODS: Corn and snap beans, squash and cucumbers were planted in a trench under clear mulch on May 13 and May 19 respectively. Preplant incorporated (ppi) treatments were applied before planting and incorporated immediately with a garden tiller. Pre-emergence (pre) treatments were applied immediately after seeding, before crop or weed emergence and before mulch application.

Tomatoes were transplanted on May 28, cucumbers and cantaloupe were transplanted on June 8. Preplant incorporated treatments were applied just before transplanting. Pre-emergence treatments were applied after transplanting but before weed emergence. All transplants were covered with a plastic row tunnel.

One-half of each cucumber (under row tunnels), tomato and cantaloupe plot was weeded in early July.

Plots consisted of a single 5 m row. There were 3 replications of all treatments.

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*Financially supported by the Technology Transfer Program, ASA II.

RESULTS:

All rates in tables are in kg/ha active ingredient (a.i.)

TABLE I. WEED CONTROL IN CORN UNDER PLASTIC MULCH

Treatment	Rate kg/ha	Time	Yield doz/plot	% Weed Control* BLW	AG	QG
Primextra	3.8	pre	10	100	97	83
Eradicane	4.0	ppi				
+ atrazine	1.1	pre	9	100	98	95
Sutan	4.0	ppi				
+ atrazine	1.1	pre	9	100	100	88
Lasso	2.5	pre				
+ atrazine	1.1	pre	7	98	95	83
Eradicane	4.0	ppi	7	60	100	88
Bladex	3.4	pre	4	92	55	88
Atrazine	1.1	pre	3	88	42	77
Bladex	2.3	pre	2	83	17	92
Check			1	35	40	90

*BLW - annual broadleaf weeds
AG - annual grasses
QG - quack grass

TABLE II. WEED CONTROL IN SNAP BEANS UNDER PLASTIC MULCH

Treatment	Rate kg/ha	Time	Honeygold kg/plot	Contender kg/plot	% Weed Control* AG	BLW
Afesin	1.1	pre	4.6	10.2	55	98
Afesin	0.75	pre	4.0	8.7	67	98
Treflan	0.75	ppi				
+ Afesin	0.75	pre	4.6	16.1	93	92
Premerge	3.0	pre	4.6	10.5	82	97
Patoran	1.0	pre	2.5	2.3	13	83
Treflan	0.75	pre				
+ Patoran	0.75	pre	3.8	6.8	65	100
Eptam	3.75	ppi				
+ Amiben	2.25	ppi	4.5	12.7	87	93
Eptam	3.25					
+ Amiben	2.25	pre	1.7	7.6	80	90
Weedy Control			1.3	2.4	20	48
Hand Weeded Control			4.7	11.9	58	52

*AG - annual grasses; BLW - annual broadleaf weeds.

Metobromuron was the only treatment that caused serious injury to the crop. Weed control observations were made prior to initial weeding.

TABLE III. WEED CONTROL IN DIRECT SEEDED CUCUMBERS UNDER MULCH

Treatment	Rate kg/ha	Time	Crop*		Yield kg/plot	% Weed Control**	
			V	First Harvest		BLW	AG
Dyanap	5.0	pre	12	Aug. 6	81.8	95	80
ethalfluralin	2.0	pre	55	Aug. 8	24.8	96	87
Treflan	0.55	pre	23	Aug. 8	49.5	88	77
Prefar	5.5	ppi					
+ Alanap	5.5	pre	15	Aug.13	21.2	48	45
Prefar	5.5	pre					
+ Alanap	5.5	pre	32	Aug.16	5.9	62	0
Devrinol	1.25	ppi					
+ Dyanap	5.0	pre	33	Aug.10	49.8	100	96
Alanap	5.0	pre					
+ Dual	1.68	pre	25	Aug.23	3.6	57	93
Premerge	4.48	pre	83	Aug.13	4.7	100	100
Weedy Check			37	Aug.18	6.2	35	10
Hand Weeded Check			32	Aug.11	34.9	97	85

* V - % reduction in vigor.

**AG - annual grass; BLW - annual broadleaf weeds.

In addition to giving the earliest and highest yield, Dyanap plots produced the largest fruits.

TABLE IV. WEED CONTROL IN DIRECT SEEDED SQUASH UNDER PLASTIC MULCH

Treatment	Rate	Time	Crop*		% Weed Control**	
			V	Yield kg/plot	BLW	AG
Dyanap	5.0	pre	58	0	92	77
ethelfluralin	2.0	pre	36	8.3	96	93
Treflan	0.55	pre	19	17	77	40
Prefar	5.5	ppi				
+ Alanap	5.5	pre	28	1.2	63	45
Prefar	5.5	pre				
+ Alanap	5.5	pre	28	2.3	67	57
Devrinol	1.25	ppi				
+ Dyanap	5.0	pre	100	0	99	98
Alanap	5.0	pre				
+ Dual	1.68	pre	40	0.5	82	97
Premerge	4.48	pre	88	0	100	93
Weedy Control			22	3.3	45	28
Hand Weeded Control			18	12.8	92	82

* V - % reduction in vigor of crop.
**BLW - broadleaf weeds; AG - annual grass.

Squash were once-over harvested on September 9. Treflan gave the highest yield and the largest number of fruit.

TABLE V. WEED CONTROL IN TOMATOES UNDER PLASTIC ROW TUNNELS

Herbicide	Rate kg/ha a.i.	Time	Crop V	Crop Yield kg/plot	% Weed Control BLW* S**	% Weed Control BLW* V	% Weed Control AG S	% Weed Control AG V
Enide	5.0	pre	18	24.2	68	48	35	27
Enide	3.0							
+ Sencor	0.25	pre	18	36	100	100	75	50
Sencor	0.50	ppi	12	22	95	5	65	33
Sencor	0.25	Early Post						
+ Sencor	0.25	Late Post	15	30	97	23	73	52
Tillam	5.0	ppi						
+ Amiben G	4.0	pre	25	41	68	33	93	28
Sencor	0.37	ppi						
	0.37	Early Post	17	28	100	100	65	5
Tillam	5.0	ppi						
+ Sencor	0.37	ppi	20	36	100	100	93	52
Devrinol	2.0	ppi	15	28	85	20	68	27
Devrinol	2.00	ppi						
+ Enide	3.0	pre	12	23	67	18	75	17
Unweeded			23	14	45	28	32	17

* BLW - Annual broadleaf weeds - AG - annual grass.
**% reduction in stand - S and Vigor - V.

Plots treated with Tillam plus Amiben G had the largest fruit, highest total yield and earliest harvest.

TABLE VI. WEED CONTROL IN TRANSPLANT CUCUMBERS UNDER PLASTIC ROW TUNNELS

Treatments	Rate kg/ha	Time	Crop V*	Crop Yield kg/plot	% Weed Control** BLW	% Weed Control** AG
ethalfluralin	1.4	pre	18	70	63	57
Dacthal	11.75	pre	18	99	67	83
Prefar	5.5	ppi				
+ Alanap	5.5	pre	37	67	75	73
Prefar	5.5	pre				
+ Alanap	5.5	pre	22	33	77	35
pendimethalin	1.0	pre	55	3	100	82
Alanap	5.0	pre				
+ Dual	2.2	pre	40	25	95	98
Treflan	0.75	pre	70	0	100	70
Prefar	5.0	ppi				
+ Amiben G	2.0	pre	17	54	62	53
Alanap	5.5	pre	20	42	80	20
Weedy Check			3	41	55	45

* % reduction in vigor - V.
**BLW - annual broadleaf weeds; AG - annual grasses.

All plots required weeding on July 7 to control escapes. First harvest date for most treatments was August 6 to 8 with exception of pendimethalin on August 23.

TABLE VII. WEED CONTROL IN MELONS UNDER PLASTIC ROW TUNNELS

TREATMENTS	RATE kg/ha	TIME	V**	CROP YIELD kg/plot	BLW*	AG
ethalfluralin	1.4	pre	30	13	100	50
Dacthal	11.75	pre	19	39	70	87
Prefar	5.5	ppi				
+ Alanap	5.5	pre	3	18	72	83
Prefar	5.5	pre				
+ Alanap	5.5	pre	32	10	70	48
pendimethalin	1.0	pre	72	0	100	83
Alanap	5.0	pre				
+ Dual	2.2	pre	53	3	87	93
Treflan	0.75	pre	80	0	100	96
Prefar	5.0	ppi				
+ Amiben G	2.0	pre	32	11	50	78
Alanap	5.5	pre	25	3	53	61
Weedy Check			25	7	13	40

* BLW - broadleaf weeds; AG - annual grass - % weed control.
**V - % reduction in crop vigor.

Plots treated with Dacthal were earliest, had the best yield and largest number of quality fruit.

CONCLUSIONS: Growers are restricted to using herbicides registered on the respective crops. Two years of research has indicated that recommended treatments are effective and safe when used under plastic mulch. Weed control recommendations and comments based on research results are listed below.

Sweet Corn - For annual broadleaf weeds and grasses apply Primextra at 6.5 to 8.5 L/ha product. Where quack grass is a problem or dry soil conditions prevail Eradicane should be preplant incorporated at 4 to 7.75 L/ha followed by atrazine at 1 kg/ha a.i. pre-emergence.

Snap Beans - For control of annual broadleaf weeds and grasses apply Treflan at 0.6 to 1.1 kg/ha a.i. ppi followed by Afesin at 5.5 to 8.75 L/ha product pre-emergence. Generally, the lower rates give effective weed control and the highest yields. Afesin should not be used on soil with less than 3% organic matter and seed should be planted deep. If quack grass is a problem, Eptam should be used at 4.25 to 5.5 L/ha product rather than Treflan. On low organic soils, use Dinoseb (Dinitro or Premerge) rather than Afesin.

Direct Seeded Cucumbers - Under clear mulch, apply Dyanap at 14 to 16.8 L/ha product. The low rate has given effective control for several weeks, however, one hoeing will be required for maximum yield.

Direct Seeded Squash Under Clear Mulch - None of the registered treatments have given reliable weed control. Excellent results with Treflan (not registered) warrant further evaluation.

Tomatoes - Under plastic row tunnels, treatments of Enide + metribuzin (Sencor or Lexone) pre-emergence and with Tillam preplant incorporated followed by Amiben G have provided the best yields and effective weed control. Treatments containing Enide have given good control over two years of trials. Metribuzin is registered on processing tomatoes only. Weed control between the row tunnels could be obtained with Enide or metribuzin.

Weed Control in Cucumbers and Melons Under Plastic Row Tunnels - Due to inconsistent control and the high cost of herbicides for these crops, it is recommended that black mulch be used under the tunnel for effective weed control. Dinoseb should be applied over the top of tunnels for inter-row weed control.

WEED CONTROL FOR TRANSPLANTED COLE CROPS

BY

D. J. DOOHAN

Abstract: Several herbicides provided good weed control in transplanted cabbage and cauliflower.

INTRODUCTION: Weed control in cole crops has recently been complicated by the removal of TOK (nitrofen) herbicide from the market. Presently most growers rely on a combination of Treflan herbicide and one or more cultivations. This system does not give consistent weed control particularly with early spring planting. This report deals with a trial to evaluate several new herbicide treatments for cabbage and cauliflower.

METHODS: Cabbage and cauliflower were planted in a growers field in Maugerville in early June 1982. Preemergence (pre) treatments were applied on June 11 and postemergence (post) treatments were applied on June 24. Treflan preplant incorporated (ppi) was applied before transplanting by the grower. All treatments containing Treflan were on cauliflower those without Treflan were on cabbage. Observations on weed control and crop tolerance were made on July 7. Results are an average of 3 replications from plots 1 m x 5 m.

Table 1: Effect of Herbicides on Weed Control In Cole Crops

Herbicide	Rate kg/ha a.i.*	Time	Crop S**	Crop V	Weeds S	Weeds V
TOK	1.34	post	4	15	87	77
Dacthal	10.0	pre	12	0	62	53
Treflan	1.0	ppi				
+ Devrinol	1.5	pre	34	30	92	78
Goal	1.0	post	0	17	77	65
Treflan	1.0	ppi				
+ Amiben G	3.0	pre	12	13	85	30
Treflan	1.0	ppi				
+ Lontrel	0.25	post	12	14	75	48
Lontrel	0.25	post	12	13	45	30
Hand Weed Check			0	22	100	100
Weedy Check			0	22	0	0

* a.i. - active ingredient
**Percent reduction in stand (S) and vigor (V).

Predominant weeds; smartweed, lambsquarters, clover.

Treflan/Amiben G, Goal and Treflan/Lontrel gave good weed control. Control with Treflan/Devrinol was excellent but crop injury was higher than the other treatments. Tok (no longer on the market) Goal and Lontrel caused a mottled spotting on crop leaves. There was also a plot with Goal showing interveinal chlorosis on the crop. There were a few dead transplants in the Treflan/Devrinol plots which increased the crop injury rating. Lontrel caused severe epinasty on smartweed but did not control it.

CONCLUSION: Treatments tested in this experiment require further evaluation to validate their efficacy and to support registration proposals. Growers should realize that not all treatments tested are presently registered.

In most plots weed control was beginning to break down one month after treatment indicating the necessity of cultivation.

POSTEMERGENCE CONTROL OF QUACKGRASS FOR CARROTS

BY

D.J. DOOHAN

Abstract: Poast herbicide effectively controlled quackgrass for the growing season resulting in good growth and development of the carrot crop.

INTRODUCTION: Poast developed by BASF under the code number BASF9052 is a selective, postemergence, broad-spectrum graminicide with no phytotoxicity to broadleaf crops or weeds. It is effective at low rates against annual and perennial grasses. Registration on major crops is anticipated in 1983 and an active program to develop Poast for the smaller acreage horticultural crops is underway. (BASF Technical Bulletin).

METHODS: Poast was applied to carrot plots in a quack-grass infested field at Sheffield Farms, Maugerville, N.B. on July 13, 1981. Carrots were 15-20 cm high and were being smothered by quackgrass. Rates of Poast were; 0.5, 0.75, 1.0 and 2.0 kg/ha active ingredient. BASF oil concentrate was added to all spray mixtures at 0.1% of spray volume.

RESULTS: Initial control of quackgrass was good at all rates tested, however, by late September regrowth had occurred in all plots. In the plots with the three higher rates, regrowth was stunted and carrot growth was unaffected by quackgrass competition.

CONCLUSION: Poast herbicide provided satisfactory control of quackgrass in carrots. Poast should be effective for control of grasses in most broadleaf crops in New Brunswick.

THE EFFECT OF SEVERAL HERBICIDES ON THE SEVERITY OF BEAN ROOT ROT

BY

KELVIN LYNCH AND D. DOOHAN

Abstract: None of the herbicide treatments had any significant affect on the severity of bean root rot.

INTRODUCTION: Different herbicides, notably Eptam have been shown to increase the severity of bean root rot (Wyse et al, 1976a). A trial was carried out to evaluate this interaction under New Brunswick conditions with the currently recommended herbicides.

METHODS: Bean seed of the variety Eagle was planted in 5 meter rows with each plot having 2 guard rows and 2 sampling rows. Fertilizer was side-banded at 44.8; 89.6 and 89.6 kg/ha of N; P and K. Planting was done on May 26 with harvesting on June 29. Roots were rated using the disease index as described by Wyse et al, 1976b (1 = no disease, 5 = severe disease). Plants were dried for 48 hours at 50°C and dry weights recorded. Experimental design consisted of a RCB with 4 replications. All herbicides were applied on May 26 except as indicated in Table 1.

RESULTS:

Table 1 The Effect of Several Herbicides on the Severity of Bean Root Rot

Treatment	Rate Kg/ha	Disease Index (1-5)	Plant Weight grams/plant
Eptam*	4.0	2.60 a**	0.56 a
Patoran	1.1	2.52 a	0.36 a
Premerge	3.0	2.20 a	0.50 a
Eptam	4.0	2.48 a	0.56 a
Untreated	-	2.34 a	0.51 a

Rates Are Active Ingredients

* Applied and incorporated one week prior to planting
** Numbers followed by the same letter are not significantly different at the 5 percent level D.M.R.

TABLE 2: The Effect of Several Herbicides on Snapbean Vigor and Weed Control

Treatment	Rate		Beans		Weeds		Quack Grass	
Herbicide	kg/ha	Date	S	V	S	V	S	V
Eptam ppi*	4.0	May 18	33	34	68	63	63	48
Patoran pre	1.1	May 25	61	63	97	85	38	44
Premerge pre	3.0	May 25	18	25	65	55	36	35
Eptam ppi	4.0	May 25	30	33	61	58	51	39
Untreated			24	29	0	5	25	21

Rates are active ingredient **ppi-prelant incorporated; pre-premergence **Visual Ratings of Percent Reduction In Stand (S) and Vigor (V).

DISCUSSION AND CONCLUSIONS: None of the herbicide treatments affected the severity of bean root rot or plant weight. Isolations from infected roots yielded both _Rhizoctonia_ _solani_ and _Fusarium_ sp.

The predominant weed species were lambsquarters, hempnettle, ladies thumb, corn spurry, rock cress, wild buckwheat, sheep sorrel and quackgrass. Treatments of Eptam and Premerge gave some control of broadleaf annual weeds. Eptam gave suppression of quackgrass (couch). Growers should not depend on any one herbicide for total weed control but rather should consider integrating systems of one or more herbicides with cultivation. Weed control with Patoran was excellent however crop injury was very high.

REFERENCES: Wyse, D.L; W. F. Meggitt and D. Penner. 1976a. Herbicide Root Rot Interaction in Navy Bean. Weed Science. 24:16-21.

Wyse, D.L.; W.F. Meggitt and D. Penner. 1976b. Effects of Herbicides on the Development of Root Rot in Bean. Weed Science. 24:11-15.

THE EFFECT OF DIFFERENT LEVELS OF NITROGEN APPLICATION AT PLANTING ON THE SEVERITY OF BEAN ROOT ROT

BY

KELVIN LYNCH AND RENALD CORMIER

Abstract: Nitrogen when applied at 45 kg/ha increased the severity of bean root rot but did not decrease plant weight as compared to the 0 kg/ha rate.

INTRODUCTION: Several studies (Maier, 1968; and Maurer et al 1965) have examined the importance of nitrogen levels in influencing the severity of root rot. This study was initiated to determine if the amount of nitrogen applied at planting affected the severity of bean root rot.

METHODS: Eagle variety beans were planted in 10 meter rows on May 26. The experimental design consisted of a RCB with treatments replicated four times in 10 meter rows. Eptam at 4.0 kg/ha was incorporated prior to planting and phosphorous and potassium were banded at 89.6 kg/ha each. Nitrogen was banded at rates of 0,22.4, 33.6 and 44.8 kg/ha. Fifty plants from the centre of each row were harvested on June 29 and rated using the disease index described by Wyse et al, 1976 (1 = no disease, 5 = severe disease). These plants were dried for 48 hours at 50°C and dry weights recorded.

RESULTS: The effect of different levels of nitrogen application at planting on the severity of bean root rot.

Treatment	Disease Severity	Dry Weight
0 kg/ha nitrogen	1.73 a*	0.58a
22.4 kg/ha nitrogen	1.94 a	0.64a
33.6 kg/ha nitrogen	1.80 a	0.68a
44.8 kg/ha nitrogen	2.20 b	0.52a

*Numbers followed by the same number are not significantly different at the 5 percent level D.M.R.

DISCUSSION AND CONCLUSION: Isolations from diseased plants yielded both Rhizoctonia solani and Fusarium sp. Compared to the zero rate of nitrogen application increasing amounts of nitrogen increased the disease severity index but this was only statistically significant at the 44.8 kg/ha rate. Increased rates of nitrogen did not statistically affect dry plant weight.

REFERENCES: Maier, C.P. 1968. Influence of Nitrogen Nutrition on Fusarium Root Rot of Pinto Bean and its Suppression by Barley Straw. Phytopathology. 58:620-625.

Maurer, C.L. and R. Baker. 1965. Ecology of Plant Pathogens in Soil II. Influence of Glucose Cellulose and Inorganic Nitrogen Amendments on Development of Bean Root Rot. Phytopathology. 55:69-72.

Wyse, D.L.; W.F. Meggitt and D. Penner. 1976. Effects of Herbicides on the Development of Root Rot in Bean. Weed Science. 24:11-15.

AN EVALUATION OF BRAVO 500 AND TRI-COP 53 FOR CONTROL OF CENTRAL HEAD ROT OF BROCCOLI

BY

KELVIN LYNCH AND GILLES MOREAU*

Abstract: The percentage of broccoli plants with central head rot was not significantly reduced by applications of Bravo 500, Bravo 500 + Tri-Cop 53, or Tri-Cop 53 as compared to the untreated. Tissue analysis of rotted florets revealed that they had only 82% as much calcium as healthy florets.

INTRODUCTION: A rot which develops in the center of the broccoli head as it approaches maturity plagues production in New Brunswick and other areas. The first sign of the disorder is an apparent cessation of growth of the central florets which produces a somewhat concave head. Rot then develops in this part of the head, the incidence of which seems to increase with periods of extended precipatation. Losses in commercial fields as high as 20% have been recorded.

METHODS: Seed of the broccoli variety Gem Hybrid was planted in seedbeds on May 24 and June 4. Plants from these two dates were transplanted into the field on June 28 and July 9. The experimental design consisted of four treatments, replicated three times on each of the two planting dates. An individual plot consisted of a single row of 20 plants at a 40 cm in-row spacing. All treatments rows of broccoli had double rows of corn planted on each side to minimize spray drift. Treatments applied were Bravo 500, 4.8 L/ha; Bravo 500 + Tri-Cop 53, 4.8 L/ha + 2 kg/1000 L; and Tri-Cop 53, 2 kg/1000 L (all rates are in terms of product). The first spray of all treatments was applied when the head was 2.5 cm in diameter, August 4 and 17 for the June 28 and July 9 transplanting dates respectively. Repeat applications of the Tri-Cop 53 treatment only were applied on August 12, 17, 21, 26, 31, September 4 and 9 for the June 28 transplanting and August 21, 26, 31, September 4, 9 and 15 for the July 9 transplanting.

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*Gilles Moreau is the head of the research farm maintained by McCains Foods at Grand Falls, New Brunswick. Special thanks is expressed to Mr. Moreau who carried out most of the actual work on this trial and commendation goes to McCains Foods for their financial support and forsightedness in recognizing the importance and ultimate benefit of applied research.

Heads from the June 28 transplanting date were harvested on August 11, 16, 20, 25, 30, September 3, 8, and 14 and from the July 9 transplanting date on August 20, 25, 30, September 3, 8, and 14. All heads were split and rated for rot. Tissue analyses were performed on a sample of terminal head florets, contrasting both healthy versus rotted and central versus peripheral.

RESULTS:

TABLE I. AN EVALUATION OF BRAVO 500 AND TRI-COP 53 FOR CONTROL OF CENTRAL HEAD ROT OF BROCCOLI

	June 28 Planting		July 9 Planting	
Treatment	% Rot	% Healthy	% Rot	% Healthy
Untreated	24	76a*	8	92a
Tri-Cop 53	10	90a	13	87a
Tri-Cop 53 + Bravo 500	36	64a	5	95a
Bravo 500	20	80a	19	81a

*Numbers followed by the same letter are not significantly different at the 5% level D.M.R.

TABLE II. TISSUE ANALYSIS: TERMINAL HEAD FLORETS OF BROCCOLI

Florets Analyized	Percent of Dry Wt.					PPM				
	N	P	K	Ca	Mg	Zn	B	Cu	Mn	Fe
Healthy Central	5.6	.66	2.9	.42	.20	48	43	7	26	68
Rotted Central	5.8	.65	2.7	.39	.19	51	44	6	25	70
Healthy Peripheral	5.2	.66	2.8	.43	.22	44	38	9	23	72
Rotted Peripheral	5.7	.67	2.9	.31	.20	47	44	6	23	70

DISCUSSION AND CONCLUSIONS: Neither Bravo 500, Tri-Cop 53 nor the combination treatment significantly reduced the percentage of plants with central head rot as compared to the untreated. The seven-day to harvest minimum for Bravo 500 restricted the possible effective usefulness of this and the combination treatment as they could only be applied once. The Tri-Cop 53 treatment was not thus restricted, however even with seven applications in planting one and six applications in planting two, no reduction in rot occurred. Too little is understood of this disorder to speculate on reasons for this failure to achieve control however it has been observed that pesticides do loose effectiveness once scenescence, natural or induced commences.

Tissue analysis of the respective tissues did not yield any significant differences except for the element Calcium (Table II). The combined percent Calcium of the rotted florets was only 82% of that of the healthy florets. This is of particular interest as Calcium deficiencies in other plants have been shown to cause disorders of the youngest plant parts (i.e. tipburn of Brussels sprouts; blossom end rot of tomatoes, and black heart of celery).

EFFECT OF VARIOUS ANTIBIOTICS AND TEMPERATURE SEED TREATMENTS ON PLANT STAND AND GROWTH OF JADE CROSS BRUSSELS SPROUTS

BY

KELVIN LYNCH AND DR. C. LOCKHART

Abstract: Seed of the Brussels sprouts variety Jade Cross were treated with either aureomycin or streptomycin at a 500 ppm concentration. Treatments consisted of either a 25 or 120 minute soak at 50° or 20°C respectively. Additional treatments of aureomycin at 100 ppm or 500 ppm in acetone were also evaluated. All antibiotic-water soaks reduced plant stand compared to the hot water seed treatment except for the 120 minute streptomycin soak followed by NaOCl. Seed treated with aureomycin plus NaOCl produced normal black rot free plants when transplanted to the field.

INTRODUCTION: Black rot of crucifers induced by Xanthomonas campestris represents a serious and constant threat to cole crop production in the Maritimes. The practice of growing transplants in saturated peat in greenhouses lends itself to rapid seedbed spread of the pathogen and consequently in certain seasons major outbreaks of the disease occurs in the field. The conventional hot water seed treatment does not completely rid seed of the bacterium and therefore under our conditions is not suitable. Treatments of the seed with antibiotics have shown greater efficacy but unfortunately have also been phytotoxic. The discovery that the antibiotic treatment followed by a sodium hypochlorite soak was less phytotoxic made the possibility of using antibiotics worth evaluating.

METHODS:

Greenhouse Trial - Seed of the Brussels sprouts variety Jade Cross were treated with the treatments listed in Table I and planted on March 18. Plants were rated for phytotoxicity (color and vigor) at approximately weekly intervals and harvested on April 19. Plants were dried at 50°C for 48 hours and dry weights recorded. Mean maximum temperature during this period was 27°C and mean minimum 15°C. Fifty seeds were planted per replication and the experimental design consisted of an RCB with three replications.

Explanation of the notation used in Tables I, II and III is as follows:

1. 20/120 - seed soaked in 20°C water for 120 minutes.
2. 50/25 - seed soaked in 50°C water for 25 minutes.
3. Acetone - seed soaked for 24 hours in acetone and rinsed with water for two minutes.
4. Aureo. or Strepo. - either aureomycin (Chlorotetracycline hypochloride, technical 99.9%) or streptomycin (fr. Boehringer Mannheim 100%) was added to water or acetone at 500 ppm and soaked at a 20° or 50°C temperature for the indicated time durations.
5. NaOCl - sodium hypochorite at a concentration of 0.5% was used for a 30 minute soak following the indicated treatments.

Growth Cabinet Trial - Seed of the Brussels sprouts variety Jade Cross were treated with the treatments listed in Table II and planted on March 18. Plants were grown under a 12-hour light at 15° and 12-hour dark at 10°C regime. Evaluation and treatment of the plants was as described for the greenhouse trial except the trial was nonreplicated and only 50 seeds per treatment were planted.

Field Plantings - Seed of the Brussels sprouts variety Jade Cross were treated with a 50/25 + Aureomycin + NaOCl treatment and planted in a greenhouse on May 3rd. Two separate commercial fields in the Rogersville area were selected and 500 transplants planted in each field on June 8th and 9th.

RESULTS:

Growth Cabinet Trial - As the trial was nonreplicated no evaluation in terms of statistically significant results can be given. However, certain trends do appear (Table I) with Aureomycin 20/120, Aureomycin 50/25, Aureomycin 50/25 + NaOCl, Streptomycin 20/120, Streptomycin 50/25 and Acetone treatments all apparently reducing plant stand. Plant size as measured by dry weight was reduced by treatments Aureomycin 20/120, Aureomycin 50/25, Streptomycin 20/120 and perhaps the acetone-aureomycin combinations.

Greenhouse Trial - Compared to untreated seed which had the highest percent germination (81.4%), all treatments which contained an antibiotic component reduced plant stand except for the Acetone + 500 ppm Aureomycin treatment (Table II). Untreated seed does not, however, represent a real alternative and therefore a comparison to hot water treated seed (50/25 - 75.4%) is perhaps more valid. In this comparison, the antibiotics fair better with Streptomycin 20/120 plus NaOCl, Acetone plus 100 ppm aureomycin and Acetone plus 500 ppm aureomycin not being significantly different from 50/25. None of the aureomycin-water combinations had acceptable levels of germination even when followed by NaOCl. Streptomycin 20/120 plus NaOCl with a germination rate of 69.4% was the best antibiotic-water combination, however, it still represents a 14.7% decrease in germination compared to untreated seed and a 8% decrease compared to hot water treated seed. Following the antibiotic-water treatments with a NaOCl soak improved plant stand and weight in all cases (Tables I & II) and also improved plant color and vigor ratings (Table III).

Field Plantings - Of the two plantings of 500 plants each in commercial fields which received the 50/25 + aureo. + NaOCl treatment final plant stands were comparable to nearby hot water treated seed plantings. Black rot did not develop in these plants, however, no black rot was observed in any of the commercial fields in this area this season.

TABLE I. EFFECT OF VARIOUS ANTIBIOTIC AND TEMPERATURE SEED TREATMENTS ON PLANT STAND AND PLANT WEIGHT (GROWN UNDER 15°C DAY AND 10°C NIGHT TEMPERATURES)

Treatment	Percent Emerg.	Dry Wt. Gram/pt.
Untreated	84	3.48
20/120	73	3.54
20/120+NaOCl	82	3.39
50/25	84	2.23
50/25+NaOCl	90	3.46
20/120+Aureo.	48	1.43
20/120+Aureo.+NaOCl	74	3.52
50/25+Aureo.	56	0.68
50/25+Aureo.+NaOCl	58	2.12
20/120+Strepto.	60	1.02
20/120+Strepto.+NaOCl	90	3.16
50/25+Strepto.	64	2.39
50/25+Strepto.+NaOCl	86	3.03
Acetone	64	2.17
Acetone+100 ppm Aureo.	74	1.87
Acetone+500 ppm Aureo.	76	1.70

TABLE II. EFFECT OF VARIOUS ANTIBIOTIC AND TEMPERATURE TREATMENTS ON PLANT STAND AND PLANT WEIGHT (MEAN MAX. 27°/MEAN MIN. 15°)

Treatment	Percent Emerg.	Dry Wt. gram/Pt.
Untreated	81.4h*	5.29b
20/120	76.0fgh	5.08b
20/120+Na0Cl	77.4gh	4.43b
50/25	75.4fgh	4.37b
50/25+Na0Cl	64.6cdef	4.30b
20/120+Aureo.	61.4cde	3.02ab
20/120+Aureo.+Na0Cl	58.6cd	4.38b
50/25+Aureo.	59.4cd	2.57ab
50/25+Aureo.+Na0Cl	54.6bc	3.48ab
20/120+Strepto.	44.0ab	1.11a
20/120+Strepto.+Na0Cl	69.4cfg	3.38ab
50/25+Strepto.	42.6a	2.38ab
50/25+Strepto.+Na0Cl	60.6cde	3.87ab
Acetone	64.0cde	4.06b
Acetone+100 ppm Aureo.	68.6defg	4.25b
Acetone+500 ppm Aureo.	71.4efgh	4.44b

*Those numbers followed by the same letter are not significantly different at the 5% level of DMR.

TABLE III. EFFECT OF VARIOUS ANTIBIOTIC AND TEMPERATURE SEED TREATMENTS ON COLOR AND VIGOR

Treatment	Growth Cabinet Study (15°/10°C)				Greenhouse Study (27°/15°C)			
	9 Days*		32 Days*		9 Days		32 Days	
	C	V	C	V	C	V	C	V
Untreated	4	4	4	4	4	4	4	4
20/120	3	4	4	4	4	4	4	4
20/120+NaOCl	3	4	4	4	4	4	4	4
50/25	4	4	4	4	4	4	4	4
50/25+NaOCl	4	4	4	4	4	4	4	4
20/120+Aureo.	1	2	4	3	1	1	4	4
20/120+Aureo.+NaOCl	3	3	4	4	2	3	4	4
50/25+Aureo.	1	1	4	2	1	1	4	4
50/25+Aureo.+NaOCl	3	2	4	3	3	3	4	3
20/120+Strepto.	1	2	4	3	1	1	3	2
20/120+Strepto.+ NaOCl	3	3	4	4	2	3	4	4
50/25+Strepto.	2	3	4	4	1	1	4	4
50/25+Strepto.+ NaOCl	3	3	4	4	2	3	4	4
Acetone	3	3	4	3	4	3	4	4
Acetone+100 ppm Aureo.	3	3	4	3	4	3	4	4
Acetone+500 ppm Aureo.	3	3	4	3	3	3	4	4

*9 and 32 days after planting.

Color (C) Key

1. mostly purple
2. chlorotic with purple veins and margins
3. slight chlorosis
4. green

Vigor (V) Key

9 days	32 days
1. 0 - 1 cm	0 - 2.5 cm
2. 1 - 2 cm	2.5 - 5 cm
3. 2 - 3 cm	5 - 7.5 cm
4. 3 cm+	7.5 cm+

SPRING CEREAL VARIETY EVALUATION AND DEMONSTRATION, 1982*

BY

J. DAMBOISE AND C. MCLEAN

Abstract: Eight oat varieties, six wheat varieties and ten barley varieties were evaluated to compare yield and yield components at two locations in New Brunswick. Distinct differences were noted between varieties, species and locations.

INTRODUCTION: Farmers are aware that variety recommendations made by the Cereal Crop Committee and published in the Field Crop Variety Guide (Publication 100A) are based on reliable data but feel that the varieties should be tested in their area to account for local differences in soil and climate.

This project was established in cooperation with the "Grand Falls Soil and Crop Improvement Association" to evaluate the potential of oat, wheat and barley varieties already recommended plus some new cultivars and older varieties still grown but no longer recommended. It also served as a demonstration trial to enable growers to visit each site and to appraise the varieties being tested.

MATERIALS AND METHODS: All varieties were seeded at two locations, Florenceville and Grand Falls, on May 6th and May 7th respectively on highly fertilized potato soils following a seed potato crop. Soil analyses were:

	pH	P	K	Ca	Mg
Grand Falls	5.4	VH	VH	M	M
Florenceville	5.6	VH	VH	M	M

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* Partially funded by Technology Transfer Program, A.S.A. II

The oat, wheat and barley varieties were seeded at a rate of 100, 135 and 135 kg/ha respectively and fertilized with a 15-15-15 analysis at 280, 400 and 340 kg/ha respectively with a conventional drill in 8 x 3 M plots replicated four (4) times. The Grand Falls seedbed was rolled after the grain had emerged while the Florenceville seedbed was not rolled. All other cultural practices were similar.

Plots 1.25 x 6 m were harvested with a Hege combine. Barley was harvested on August 19th and oat varieties were harvested on August 19th and wheat on August 30th. The oat varieties were harvested on August 19th and August 30th at the Florenceville and Grand Falls location respectively.

RESULTS AND DISCUSSION: Yields of all three species were lower at the Florenceville location (Table VII). Climate (Table VIII) could account for some of the yield and yield component differences between locations. Yields were higher at the Grand Falls location due to an increased head population per square meter and kernel size (Table VII) partly due to more and better rainfall distribution at that location (Table VIII). The drier growing conditions in Florenceville had a detrimental affect on the weed control which reduced yield.

Oat and wheat varieties rank similarly in yield performance at both locations. The highest yielding varieties were: Sentinel oats (Table 1, II) and Opal wheat (Table III, IV), in both trials. Barley yield rankings differed only slightly within locations where Volla and Bruce varieties out-yielded the others in Florenceville and Grand Falls respectively. There were no significant yield differences between the barley varieties tested in Grand Falls (Table V, VI). In general, the differences in yields between varieties of each species are closely related to their yield components differences (Table I-VI).

Significant difference in straw length was found. Since none of the varieties lodged, no effect of straw length on lodging resistance was evident.

Wheat had the highest protein level and protein yield per hectare. (Table VII). While the protein level of oats was higher than barley, the barley produced more protein per hectare than oats. The protein levels for all species were higher in Florenceville

TABLE 1. GRAND FALLS OAT VARIETY EVALUATION, 1982.

VARIETY	YIELD*	DRY MATTER	PROTEIN*	1000 KL WEIGHT	STRAW LENGTH	HEADS/ METRE²	HEADS/ PLANT	SPIKELETS/ HEAD
	KG/HA	%	%	GM	CM	#	#	#
SENTINEL	2922	86.4	11.1	38.2	74.3	553	2.12	25.7
SHAW	2884	85.7	12.0	38.2	74.6	505	2.85	24.9
MANIC	2740	86.1	12.0	38.1	69.6	518	2.27	31.9
LAURENT	2605	85.4	12.2	36.1	79.4	434	1.57	29.4
OXFORD	2556	86.2	11.7	40.5	76.1	537	2.18	24.4
SCOTT	2551	85.9	10.9	38.4	79.9	464	1.93	22.7
GARRY	2375	85.5	10.6	31.3	80.5	493	1.83	27.0
ELGIN	2278	85.0	12.5	44.5	70.5	559	2.45	26.4
MEAN	2614	85.8	11.6	38.2	75.6	508	2.15	26.6
C.V. %	14.6	1.0			6.9	12.3	43.2	13.2
L.S.D. 5%	561	1.3			7.7	93	1.4	5.2

TABLE 11. FLORENCEVILLE OAT VARIETY EVALUATION 1982.

	YIELDS*	DRY MATTER	PROTEIN*	1000 KL WEIGHT	STRAW LENGTH	HEADS/ METRE²	HEADS/ PLANT	SPIKELETS/ HEAD
	KG/HA	%	%	GM	CM	#	#	#
SENTINEL	1865	86.2	13.8	38.0	72.0	391	1.4	28.8
SHAW	1624	86.4	12.3	39.9	74.6	318	1.8	19.2
LAURENT	1560	85.4	13.3	32.9	82.3	391	1.7	27.4
MANIC	1530	86.4	13.4	33.8	69.5	338	1.5	29.8
SCOTT	1449	85.6	14.1	42.1	78.0	300	1.5	21.8
OXFORD	1419	86.7	12.5	32.3	75.8	295	1.5	24.6
GARRY	1277	85.7	14.4	32.9	80.5	294	1.2	26.1
ELGIN	1023	85.8	15.2	40.3	70.6	286	1.4	24.9
MEAN	1468	86.2	13.6	36.5	75.4	326	1.5	25.3
C.V. %	22.3	5.9			5.4	13.7	26.0	11.73
L.S.D. 5%	482	1.2			6.0	66	.6	4.4

* CALCULATED ON A DRY MATTER BASIS

TABLE III. GRAND FALLS WHEAT VARIETY EVALUATION, 1982

VARIETY	YIELD*	DRY MATTER	PROTEIN*	1000 KL WEIGHT	HEAD LENGTH	STRAW LENGTH	HEADS/ METRE^2	HEADS/ PLANT	KERNELS/ HEAD
	KG/HA	%	%	GM	CM	CM	#	#	#
OPAL	3261	80.5	12.5	37.9	6.6	77.9	533	2.2	36.3
MILTON	3178	79.7	13.4	39.2	6.9	76.1	549	2.6	37.3
LAVAL 19	3160	74.9	14.1	35.1	6.5	62.8	579	2.9	33.4
GLENLEA	2832	77.5	[illegible]	45.4	8.9	79.7	523	2.6	38.3
CONCORDE	2807	78.1	14.4	37.8	7.4	63.5	536	2.1	35.2
DUNDAS	2616	83.4	14.4	39.4	7.3	75.7	530	2.4	35.2
MEAN	2976	79.0	13.8	39.1	7.3	72.6	541	2.5	[illegible]
C.V. %	6.4	9.6			5.4	4.2	10.6	23.2	[illegible]
L.S.D. 5%	289	3.1			.6	4.6	87	.9	5.3

TABLE IV. FLORENCEVILLE WHEAT VARIETY EVALUATION, 1982.

VARIETY	YIELD*	DRY MATTER	PROTEIN*	1000 KL WEIGHT	HEAD LENGTH	STRAW LENGTH	HEADS/ METRE^2	HEADS/ PLANT	KERNELS/ HEAD
	KG/HA	%	%	GM	CM	CM	#	#	#
OPAL	2445	84.1	13.3	34.7	6.8	81.7	289	1.2	39.1
LAVAL 19	2424	83.6	16.3	36.0	6.6	56.9	298	1.5	35.6
MILTON	2152	84.4	16.6	36.5	6.0	74.7	366	1.9	31.3
DUNDAS	1790	82.1	16.6	35.4	6.2	76.6	359	1.6	30.4
GLENLEA	1745	82.5	15.3	40.5	7.6	80.3	308	1.4	29.1
CONCORDE	1578	83.6	16.9	37.4	7.5	60.3	285	1.1	36.0
MEAN	2022	83.4	15.8	36.75	6.8	72.1	317	1.5	33.6
C.V. %	12.5	14.0			7.4	10.0	22.8	27.1	10.4
L.S.D. 5%	380.5	3.5			.8	10.8	109	.6	5.3

* CALCULATED ON A DRY MATTER BASIS

TABLE V. GRAND FALLS BARLEY VARIETY EVALUATION, 1982

VARIETY	YIELD*	DRY MATTER	PROTEIN*	1000 KL	HEAD LENGHT	STRAW LENGHT	HEADS/ METRE ^{2}	HEADS/ PLANT	KERNELS/ HEAD
	KG/HA	%	%	GM	CM	CM	#	#	#
BRUCE	3250	87.7	11.6	31.8	5.2	68.0	633	2.6	40.3
CGA 80-33	3214	86.8	9.8	42.1	6.9	62.2	692	3.1	20.8
VOLLA	3163	86.9	10.9	38.2	6.2	64.3	691	3.2	19.9
ATLANTA	3118	85.8	10.3	41.8	7.1	62.6	668	2.8	22.0
MINGO	3098	86.9	10.9	36.3	6.6	86.3	513	1.9	49.0
BIRKA	3082	86.0	10.5	41.7	7.3	56.7	673	3.0	22.8
LOYOLA	2980	87.2	10.0	35.8	5.6	76.8	533	2.5	49.3
PERTH	2967	87.1	11.9	35.8	6.1	74.5	650	3.7	40.7
LAURIER	2952	87.4	10.9	39.4	6.6	74.6	575	2.7	40.6
BONANZA	2931	87.5	10.6	33.4	7.1	81.2	619	3.5	52.3
MEAN	3076	86.9	10.7	37.65	6.5	70.7	625	2.9	35.8
C.V. %	9.4	3.5			10.5	8.6	11.6	22.0	12.5
L.S.D. 5%	420	.7			1.0	8.8	105	.9	6.5

TABLE VI. FLORENCEVILLE BARLEY VARIETY EVALUATION, 1982.

VARIETY	YIELD *	DRY MATTER	PROTEIN*	1000 KL	HEAD LENGHT	STRAW LENGTH	HEADS METRE ^{2}	HEADS/ PLANT	KERNELS/ HEAD
	KG/HA	%	%	GM	CM	CM	#	#	#
VOLLA	2655	86.9	11.7	36.8	7.0	68.5	510	2.1	23.3
MINGO	2457	86.7	11.3	31.0	7.4	85.7	312	1.3	46.8
CGA 80-33	2265	86.7	13.1	34.8	7.7	60.0	455	2.3	21.0
ATLANTA	2257	86.4	11.4	37.9	7.2	65.7	420	2.1	24.5
BIRKA	2244	87.1	11.7	36.6	7.5	57.0	398	2.05	21.5
BRUCE	2194	87.4	11.7	31.7	7.2	63.7	377	2.1	39.5
LOYOLA	2119	87.0	11.3	32.9	7.0	72.5	324	1.6	49.3
PERTH	2035	86.6	12.3	35.0	6.9	78.5	326	1.55	40.5
LAURIER	2035	87.0	10.9	37.3	7.2	75.5	234	1.6	47.3
BONANZA	1811	87.4	12.2	32.0	6.4	72.3	420	1.2	50.0
MEAN	2207	86.9	11.8	34.6	7.2	69.9	361	1.8	36.4
C.V. %	16.0	5.1			11.6	6.1	14.6	23.2	11.1
L.S.D. 5%	512	1.0			1.2	6.2	76.3	.6	5.9

* CALCULATED ON A DRY MATTER BASIS

TABLE VII. SPRING CEREAL SPECIES PERFORMANCE ACROSS TESTING LOCATIONS, 1982

PARAMETER	OAT		WHEAT		BARLEY	
	GR.FALLS	FLORENCEVILLE	GR.FALLS	FLORENCEVILLE	GR.FALLS	FLORENCEVILLE
YIELD (KG/HA)	2614	1468	2976	2022	3076	2287
DRY MATTER %	85.8	86.2	79.0	83.4	86.9	86.4
PROTEIN %	11.6	13.6	13.8	15.0	10.7	11.4
PROTEIN YIELD(KG/HA)	303	200	411	319	329	260
WEIGHT/1000K(GM)	38.2	36.5	33.1	36.75	37.65	34.6
HEAD LENGHT (CM)	N/A	N/A	7.3	6.8	6.5	7.2
STRAW LENGHT (CM)	75.6	75.4	72.6	72.1	70.7	69.9
PLANTS PER M²	252	224	223	219	225	205
HEADS PER M²	508	326	541	317	625	361
HEADS PER PLANT	2.15	1.5	2.5	1.5	2.9	1.8
KERNELS PER HEAD	25.3	25.3	36.1	33.6	35.8	36.4

* NOT SHOWN IN PREVIOUS TABLES, DID NOT VARIED SIGNIFICANTLY BETWEEN VARIETIES

** CALCULATED,,YIELD x % PROTEIN

TABLE VIII. GRAND FALLS AND CENTREVILLE[1] CLIMATOLOGICAL DATA*, 1982 GROWING SEASON

	MONTHS - LOCATIONS							
	MAY		JUNE		JULY		AUGUST	
	G.FALLS	C'VILLE	G.FALLS	C'VILLE	G.FALLS	C'VILLE	G.FALLS	C'VILLE
AIR TEMPERATURE								
MAX	17.7	19.5	20.3	21.6	24.2	25.7	19.4	21.5
MIN	4.7	4.0	9.2	8.4	12.2	12.3	9.4	9.2
MEAN	11.7	11.8	14.8	15.0	18.2	19.0	14.4	15.4
ACC. G.D.D. 5% FROM MAY 1ST	204	218.5	508	538	934.5	990	1236.5	1332.5
PRECIPITATION (MM)								
1982	11.8	14.4	83.9	71.0	127.5	59.7	144	136.7
NORMAL	74.2	85.5	87.9	97.7	110.8	101.3	177.4	95.9
CONSECUTIVE DAYS WITHOUT PRECIPITATION	13	14	10	11	12	17	3	4

[1] CLOSEST WHEATHER RECORDING STATION TO FLORENCEVILLE, ABOUT 1 MILE TO EVALUATION TRIAL.

* TAKEN FROM UNVERIFIED REPORTS, COURTESY OF ATMOSPHERIC ENVIRONMENT SERVICE.

but the protein yields were higher in Grand Falls (Table VII). Since both locations received the same amount of nitrogen fertilization a higher yield would reduce the crop protein level but be more efficient in producing protein per hectare.

CONCLUSIONS: In general, this test confirms the results and recommendations of the Cereal Crop Committee. For each species, the top yielding varieties were recommended, At each location, some non-recommended varieties performed well but did not exceed the yield of recommended varities.

When selecting a variety, a grower should not look at performance data only. Consistency in yield performance over years is a more appropriate selection criteria. Other varietal characteristics such as quality, maturity, straw length, lodging resistance, etc., are important to the grower in selecting a variety for his particular needs.

These variety evaluation trials serve to confirm the value of the recommended list to a local area and demonstrate the yield of the varieties to area farmers.

REFERENCE: Damboise, J., 1981. Grand Falls Wheat and Barley Variety Evaluation. Adaptive Research Reports. Plant Industry Branch, New Brunswick Department of Agriculture and Rural Development, p. 178-202.

BARLEY SEEDING RATE EVALUATION TRIAL*

BY

J. DAMBOISE AND C. McLEAN

Abstract: Two barley varieties, Bruce and Perth, were evaluated under three seeding rates (135, 170 and 235 kg/ha) at two locations. Both varieties responded differently to seeding rates. No advantages were apparent in increasing the seeding rates of both varieties over 170 kg/ha at Florenceville and 135 kg/ha at Grand Falls. Fertility rates were constant regardless of seeding rate.

INTRODUCTION: The kernel number per unit ground area (head number and kernels per head) is an important cereal yield component. As a rule, the highest yield obtainable is directly related to the number of well filled heads produced per unit area, providing that lodging is not a problem and all heads are harvested.

There are two practical methods of increasing head population. One is to increase the tillering ratio with cultural practices such as: increasing nitrogen fertilization, reducing seeding depth, etc. Such practices are presently used by some growers to increase cereal crop head population. It is also known that heads which develop from secondary tillers are usually smaller and less productive than those developed from the main culm. Increasing the seeding rate is another factor that influences head populations. Increased seeding rate reduces tillering thus allowing a higher proportion of main culms which should increase yield potentials.

This seeding rate evaluation trial was carried out with two barley varieties to determine the influence of seeding rate on yields and yield components.

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*Partially funded by Technology Transfer Program, ASA II.

TABLE 1. BARLEY SEEDING RATE EVALUATION, GRAND FALLS, 1982.

VARIETY & SEEDING RATE	YIELD*	DRY MATTER	PROTEIN*	1000KL WEIGHT	PLANTS/ METRE²	HEADS/ METRE²	HEADS/ PLANT
	KG/HA	%	%	GM	#	#	#
BRUCE 135	3250	87.7	11.6	31.8	244	633	2.6
BRUCE 170	3188	87.6	10.9	37.5	259	732	2.9
BRUCE 235	2866	87.3	11.4	32.8	296	746	2.8
PERTH 135	2967	87.1	11.9	35.8	191	650	3.7
PERTH 170	3153	87.3	11.1	41.7	245	626	2.6
PERTH 235	2947	87.4	11.4	36.4	287	641	2.6
MEAN	3061	87.4	11.4	36.0	253	671	2.85
C.V. %	7.5	4.9			21.7	14.3	28.7
L.S.D. 5%	344.5	.9			82.9	144.6	1.2

TABLE 11. BARLEY SEEDING RATE EVALUATION, FLORENCEVILLE, 1982.

VARIETY & SEEDING RATE	YIELDS*	DRY MATTER	PROTEIN*	1000 KL WEIGHT	PLANTS/ METRE 2	HEADS/ METRE 2	HEADS/ PLANT
	KG/HA	%	%	GM	#	#	#
BRUCE 135	2035	86.6	12.3	35.0	175	326	1.9
BRUCE 170	2623	87.4	12.2	37.1	307	311	1.0
BRUCE 235	2737	87.5	11.6	36.6	332	342	1.1
PERTH 235	2194	87.4	11.7	31.7	197	377	2.1
PERTH 170	3175	86.9	9.8	36.3	343	423	1.3
PERTH 235	2960	87.1	10.5	33.4	388	407	1.1
MEAN	2620	87.15	11.35	35.0	290	364	1.41
C.V. %	14.4	4.6			17.9	13.4	27.6
L.S.D. 5%	125.6	.9			78.0	73.7	.6

* CALCULATED ON A DRY MATTER BASIS

MATERIALS AND METHOD: Two barley varieties, Bruce and Perth, were seeded at three seeding rates: 135, 170 and 235 kg/ha on May 6 and May 7 in Florenceville and Grand Falls respectively. Both projects were on high fertility potato soils, following a seed potato crop, and fertilized with a 15-15-15 analysis at 340 kg/ha. The trials were seeded and fertilized with a conventional drill in 8 x 3 metre plots replicated four times. The plots were harvested with a Hege combine on August 19 and 30 in Florenceville and Grand Falls respectively.

RESULTS AND DISCUSSION: The two barley varieties responded differently to an increase in seeding rate. Response varied with location.

At Grand Falls (Table I), Bruce barley exhibited a significant reduction in yield as seeding rates increased. This yield reduction is a reflection of the reduced number of kernels per head at the two higher seeding rates. Plant and head populations remained constant for all three seeding rates. At Florenceville (Table II), the two higher seeding rates of Bruce provided higher yields than the conventional seeding rate of 135 kg/ha. This may be the result of increased plant populations having a higher ratio of main culms as heads per plant remained constant.

No significant variation in yield was noted with increases in Perth seeding rate in Grand Falls (Table I). At Florenceville (Table II), the highest significant yields were obtained at 170 kg/ha seeding rate. At both locations, the increase in Perth seeding rate was followed by an increase in plant population, although it was more evident in Florenceville, with no significant variation in the head population.

CONCLUSION: There are no apparent yield advantages to increasing Bruce and Perth seeding rates over 170 kg/ha and 135 kg/ha in Florenceville and Grand Falls respectively. This is the result of a first year evaluation and should be considered as such.

Evaluations of this type should be continued with consideration given to adjusting fertility levels to correspond with seeding rate increases to ensure that fertility is not a limiting factor.

EFFECT OF SEEDING RATES ON PERTH BARLEY*

BY

K. J. MACISAAC

Abstract: Perth Barley, seeded at 95 lb/acre, 145 lb/acre and 190 lb/acre, yielded 2100 lb/acre, 2700 lb/acre, and 2700 lb/acre, respectively, at 14% moisture. This variety yielded poorly under excellent management.

INTRODUCTION: Perth barley is not included on the list of recommended varieties for the Maritimes. There is, however, a large acreage grown in New Brunswick, due to its excellent lodging resistance. The author has frequently noticed that in comparison to other varieties it has a poor tillering capacity. This, in combination with its large seed size which prevents an adequate seeding rate, often results in a low head population. With this in mind, this trial was designed to increase seeding rates, thus providing more heads/m^2 which seems to be the main factor limiting yield.

MATERIALS AND METHODS: A demonstration field was obtained at the farm of Arthur MacKnight in Picadilly. Perth barley was seeded on May 7 at three different seeding rates: 95 lb/acre, 145 lb/acre and 190 lb/acre, representing 2, 3 and 4 bushels/acre, respectively. 300 lb/acre of 15-15-15 was applied at seeding. All plots were harvested on August 26 by taking square meter yields.

RESULTS: TABLE I - YIELDS OF PERTH AT 14% MOISTURE

Seeding Rate (lb/acre)	Yield (lb/acre)
95	2100
145	2700
190	2700
mean	2500

The barley was harvested at 73% D.M., had a test weight of 45 lb/bu, protein percentage of 13.3, and a dockage of .5%, making No. 2 feed grain.

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*Partially funded by Technology Transfer Program ASA II

CONCLUSION: Table I indicates that a seeding rate of 145 lb/acre is optimal with 95 lb/acre decreasing yield and 190 lb/acre wasting seed.

Unfortunately, even at the high seeding rate, Perth yielded only 58 bu/acre. This field was seeded early, well fertilized, had an adequate pH, and weeds were controlled. The tremendous lodging resistance of this variety makes it very appealing and deceiving to the eye. This trial has shown that under the best management, its value is still below that of a recommended variety.

PERFORMANCE OF BARLEY VARIETIES IN SOUTHEASTERN NEW BRUNSWICK*

BY

K. J. MACISAAC

Abstract: Up to eight varieties of barley were grown in large scale plots on eleven different farms in southeastern New Brunswick. Laurier was the highest yielding at 4500 kg/hectare (14% moisture) and the average yield of all varieties was 3200 kg/hectare (14% moisture).

INTRODUCTION: Many farmers still grow varieties of barley no longer on the recommended list of Publication 100A. Farmers may feel a certain variety will react differently on their farm than on small plots at research station trials. This project was initiated for two reasons: 1. To compare the performance of recommended barley varieties in large scale plots on several farms in southeastern New Brunswick. 2. To introduce relatively new varieties and also promising future lines to farmers.

MATERIALS AND METHODS: Barley varieties were seeded on the following farms:

Hank Braam, Hillsboro - Bruce, Perth
Peter Bunnett, Havelock - Atlanta, Bruce, Ciba-Geigy 80-33, Common Seed, Laurier, Loyolla, Perth, Volla
Joe Connors, Scoudouc - Atlanta, Bruce, Ciba-Geigy 80-33, Laurier, Perth, Volla
Herb Creighton, Sussex Corner - Perth
Alex Henderson, Irishtown Road - Bruce, Ciba-Geigy 80-33, Laurier, Perth, Loyolla, Volla

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*Partially funded by Technology Transfer Program, A.S.A. II

Table 1. Yield, agronomic characteristics, and grade of barley grown at several locations in southeastern New Brunswick.

Variety	Yield* kg/hectare	Population heads m^2	Dry Matter %	Protein %	Test Weight kg/hl	Dockage %	Feed Grade #
Laurier	4472 (3)	373 (7)	86 (4)	12.5 (4)	51 (3)	.7 (3)	3
Volla	4045 (2)	494 (3)	88 (3)	11.7 (3)	64 (2)	.8 (2)	1
Bruce	3765 (6)	416 (7)	83 (7)	11.8 (7)	59 (6)	.8 (6)	1
Ciba-Geigy 80-83	3622 (2)	517 (3)	87 (3)	11.8 (3)	64 (2)	.5 (2)	1
Perth	3133 (7)	333 (7)	82 (8)	13.1 (8)	59 (7)	.7 (7)	1
Loyolla	3007 (4)	362 (6)	84 (5)	11.9 (5)	56 (4)	.8 (4)	2
Atlanta	3003 (1)	437 (4)	87 (2)	10.9 (2)	59 (1)	.5 (1)	1
Average	3195 (4)		85	12.0	59	.7	1

*At 14% moisture.

Peter Holder, Millstream - Bruce, Laurier, Perth
Winston Johnston, Irishtown Road - Atlanta, Bruce, Loyolla
Arthur MacKnight, Picadilly - Perth
Roy McCullum, Fox Hill - Bruce, Laurier, Loyolla, Perth
Ned Murray, Scoudouc - Atlanta, Bruce, Laurier, Loyolla
Ken Reicker, New Line Road - Atlanta, Bruce, Laurier, Loyolla, Perth

These varieties were seeded in early May using conventional grain drills, following recommended practices for fertility, seeding rates, weed control, etc. Plot size was approximately one acre per variety, side by side.

RESULTS: Individual reports containing detailed information are available for each farm, but the purpose of this report is to summarize the performance of all varieties across all locations, as indicated by Table 1.

DISCUSSION AND CONCLUSION: Laurier produced the highest yield with Volla, Bruce and Ciba-Geigy 80-33 providing consistently high yields.

The three two-rowed varieties had the highest population, the highest test weight, and the earliest maturity. Test weights were very low this year compared to normal and, as a result, not all varieties made Canada No. 1 Feed Grade. Protein averaged 12% which is very good for Maritime grain. Loyolla had a high moisture content and lodging, in addition to its poor yield.

The average yield of 3200 kg/ha was higher than expected and indicates that on years when growing conditions are favourable, barley can be grown successfully in the southeastern section of the province.

EVALUATION OF MANURE ON SEVERAL BARLEY VARIETIES*

By

K. J. MACISAAC

Abstract: The performance of five varities of barley under conventional fertilization was compared to a program applying manure in addition to chemical fertilizer. Manure increased yields but also increased lodging and delayed maturity.

INTRODUCTION: Rising fertilizer costs greatly affect the cost of small grain production. Members of the Moncton Soil and Crop Improvement Association are livestock owners and manure is in abundance. The response of barley to heavy application of barn-yard manure varies with variety - some varieties show increased yield while others lodge and yield decreases. This project determined performance of varieties to a program applying manure in addition to chemical fertilizer.

MATERIALS AND METHODS: A demonstration field was obtained at the farm of Joe Connors in Scoudouc. The soil tested: pH 6.0, P_2O_5 234, K_2O 75, Ca 1536 and Mg 72. Half of this field received poultry manure at the rate of 10 tons/acre in early May. Five varieties of barley were seeded at the rate of 100 lb/acre on May 24. 300 lb/acre of 10-20-10 was applied to the whole field. Varieties used were: Atlanta, Loyolla, Perth, Volla and Ciba-Geigy 80-33. Although the latter is not yet licensed, it was included as a promising line. All varieties were sampled on September 1, by taking square meter yields.

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*Partially funded by Technology Transfer Program, ASA II

RESULTS:

TABLE 1 - Yield Difference (lb/acre at 14% moisture)

VARIETY	ATLANTA	C.G.80-33	LOYOLLA	PERTH	VOLLA	MEAN
Manure Treatment	3600	3200	3100	3000	2400	3100
No manure	2700	2500	2300	2300	3000	2500
Difference	900	800	800	700	600	600
Difference (bu/acre)	19	15	18	16	-11	11

TABLE 2 - Protein Difference (%)

VARIETY	VOLLA	LOYOLLA	PERTH	ATLANTA	C.G 80-83	MEAN
Manure Treatment	16.4	15.4	16.5	12.9	11.3	14.5
No Manure	10.3	10.8	12.7	9.4	10.2	10.7
Difference	6.1	4.6	3.8	3.5	1.1	3.8

TABLE 3 - Dry Matter Difference (%)

VARIETY	LOYOLLA	VOLLA	PERTH	C.G. 80-83	ATLANTA	MEAN
No Manure	87	87	85	86	88	87
Manure Treatment	78	81	80	82	87	82
Difference	9	6	5	4	1	5

TABLE 4 - Population Difference (heads/m^2)

VARIETY	C.G. 80-83	PERTH	ATLANTA	LOYOLLA	VOLLA	MEAN
Manure Treatment	533	440	468	423	388	450
No Manure	415	340	395	375	353	376
Difference	118	100	73	48	35	74

DISCUSSION: The largest difference occurred in the two rowed varieties; Volla, Ciba-Geigy 80-33 and Atlanta. Two rowed varieties normally have a higher population than 6 rowed varieties. When nitrogen in the form of manure was applied, it caused these varieties to tiller even more profusely.

Protein is directly related to nitrogen content and Table 2 indicates a higher percentage protein for the manure treatment, indicating nitrogen was released from the manure throughout the growing season.

Manure may have a negative impact on maturity (Table 3). Manure caused the plants to stay green longer, resulting in a longer grain filling period, delaying physiological maturity.

The addition of manure increased the disease pressure but not severely. There was lack of disease innoculum in this dry year.

Both 6 rowed varieties had excellent lodging resistance although yield was lower. There is no explanation why the yield of Volla was decreased when manure was applied, other than a possible sampling error.

CONCLUSION: Varieties did react differently to treatments of manure. Applying manure in addition to commercial fertilizer increased yields by 500 lb/acre on the average. The average protein increase was 4% but dry matter content of the grain decreased by 5%. Finally, harvesting was both difficult and time consuming due to lodged grain and high moisture content.

ACKNOWLEDGEMENTS: The assistance of Mr. J. Connors in providing land is recognized.

CERONE GROWTH REGULATOR ON BARLEY

BY

C. McLEAN AND J. DAMBOISE

Abstract: Cerone (ethephon) applied at growth stage 10 to Bruce barley at 280 g ai./ha reduced peduncle length and overall straw length. A 560 g ai./ha application had similar effects, as well as increasing the moisture content of the harvested grain. In field demonstrations, Bruce, Laurier and Loyola showed yield increases, and a reduction in lodging with a 280 g ai./ha application of Cerone.

INTRODUCTION: One of the major factors affecting grain yields in New Brunswick is the problem of lodging. Lodging may reduce yields in several ways, such as restricting the ability of the plant to fill the head, increasing disease incidence, and making harvest more difficult, with greater losses.

Cerone, manufactured by Union Carbide Agricultural Products Co., has been evaluated as an anti-lodging agent in cereals. The same chemical, ethephon, has been marketed under the trade name Ethrel, for use in apples and tobacco, to synchronize harvest. Ethephon was first used on cereals in New Brunswick in 1981 (McLean 1981). Favorable results led to a more detailed evaluation in 1982.

MATERIALS AND METHODS: Cerone was evaluated on barley on both small replicated plots and large scale field demonstrations. The plot trials were conducted with the variety Bruce, seeded May 6 on a high fertility soil following potatoes, with pH 5.6, P_2O_5 460 + K_2O 300 +. The barley was seeded at 100 kg/ha, with 335 kg/ha of 15-15-15 drilled with the seed, in 8 m x 3 m plots, replicated four times in a complete randomized block design. Three rates of Cerone were used: 0, 280 and 560 grams active ingredient pee hectare.

The field trials included the varieties Bruce, Laurier, Loyola, and Volla. Sites 1 and 2 were seeded with a pneumatic seeder, with no fertilizer at seeding time. These sites received 150 kg/ha 34-0-0 at Growth Stage 5. The third site was seeded with a conventional grain drill, receiving 335 kg/ha 15-15-15 at seeding time. In all field trials, approximately two hectares of each variety was seeded, both receiving 280 g ai./ha, and half used as an untreated check. Cerone was applied to site 1 at Growth Stage 10 and sites 2 and 3 at Growth Stage 8. Two strips of approximately one-tenth hectare were harvested from each treatment and yields calculated.

RESULTS AND DISCUSSION: Results of the replicated plot trials are shown in Table I. No significant yield differences were obtained. Peduncle length and overall straw length were less with both rates of Cerone than with the check, although there was no significant difference between the low and high rates. There was no lodging problem in any of the plots. Had conditions been more conducive to lodging, yield differences may have been observed.

Percentage moisture was significantly greater with the high rate of Cerone than with the control. This may be due to a shortening of the canopy, slowing the drying process.

TABLE I. CERONE REPLICATED PLOT TRIALS

Cerone (g ai./ha)	Moisture (%)	D.M. Yield (kg/ha)	Straw Length (cm)	Peduncle (cm)
0	13.7 b*	2600 a	70 a	22 a
280	14.6 ab	2800 a	66 a	20 b
560	14.3 a	2700 a	66 a	19 b
MEAN	14.2	2700	67	20
C.V.%	3.3	9.4	3.5	3.3
L.S.D.5%	.8	400	4.0	1.2

*Within a column, numbers followed by the same letter are not significantly different.

Table II presents the results of the field demonstrations. Slight yield differences may not be significant in these trials, since only two samples were taken to determine yield. However, there appears to be a trend toward increased yields and higher moisture levels where Cerone was applied.

Bruce showed a substantial yield increase with a Cerone application in Site 1. Loyola and Laurier appeared to respond well in Site 2. This could be due to a difference in timing of application. Site 1 was treated at Growth Stage 10 and Site 2 at Growth Stage 8.

No yield differences were observed in Site 3. The growth regulator performed best where growth was vigorous and yields were high.

TABLE II. THE YIELD AND PERCENT MOISTURE OF FOUR BARLEY CULTIVARS AS AFFECTED BY THE GROWTH REGULATOR CERONE AT THREE SITES

Variety	Moisture %		D. M. Yield
		(kg/ha)	(bu./ac)
Site 1			
Laurier Control	14.0	4000	74
Laurier Cerone	14.2	4100	76
Loyola Control	13.7	3300	62
Loyola Cerone	14.0	3400	64
Bruce Control	13.9	3800	70
Bruce Cerone	14.1	4500	84
Site 2			
Laurier Control	14.0	3800	70
Laurier Cerone	14.1	4400	82
Loyola Control	13.8	3400	64
Loyola Cerone	14.0	3900	72
Site 3			
Loyola Control	13.2	2900	54
Loyola Cerone	13.3	2900	53
Volla Control	13.8	2600	49
Volla Cerone	13.8	2700	51

CONCLUSION: Before considering the use of a growth regulator on cereals, producers should assess their entire management package. Cerone is one component of an integrated ceral management program. Other factors are seeding rate, amount and timing of nitrogen, and use of a fungicide to control disease. Although the growth regulator does not actually increase the yield of the crop, when used in conjunction with optimum management practices, it will protect yield and reduce harvest losses.

Stage of application is very critical. Since Cerone acts by shortening and strengthening the straw, it must be applied while the straw is still elongating. The recommended timing is stage 8 - 10 on the Feekes Large Growth Scale (Large, 1954), which is just before the head begins to emerge. One must watch the development of the crop closely, since a few days delay in application may mean that results are not obtained.

Substantial testing is required to determine the effect of this chemical on specific cereal varieties under various management regimes. It appears that Cerone may be a valuable component of an integrated management system in maximizing cereal yields.

REFERENCES: McLean, C. 1981. Demonstration of Growth Regulator on Barley. Adaptive Research Report, Plant Industry Branch, N. B. Department of Agriculture. pp. 165-166.

Large, E. C. 1954. Growth Stages in Cereals. Illustration of the Feekes Scale. Pl. Path. 3:128-129.

SOIL FERTILITY FOR SPRING WHEAT*

BY

K.J. MACISAAC

Abstract: In addition to receiving an application of liquid hog manure, parts of a field of spring wheat received 0, 60 and 25+35 kg/ha of nitrogen respectively. These treatments yielded 3100, 3300 and 3400 kg/ha respectively at 14% moisture.

INTRODUCTION: The economics of application of chemical fertilizer to spring wheat grown on high fertility soils has been questioned. Walker and Damboise (1980) reported no advantage in applying phosphorous and potash to wheat grown on high fertility potato soils. This experiment was conducted to determine the response to applying nitrogen on high fertility soils.

MATERIALS AND METHODS: A demonstration field was selected at Stephen Moffett's farm in Penobsquis. This field, with pH 6.2, P_2O_5 222, K_2O 300, Ca 2128 and Mg 236, could be considered one of high fertility since it had received many heavy applications of liquid hog manure over the past few years. Vernon Wheat was seeded on April 23, 1982, with no chemical fertilizer. Liquid hog manure had been applied the previous fall and in early spring.

5mx8m plots were replicated four times to accommodate three treatments using urea as the nitrogen source. The first treatment received no nitrogen in addition to the hog manure. Treatment #2 received 60 kg/ha pre-emergence. Treatment #3 received 25 kg/ha pre-emergence plus an additional 35 kg/ha of N_2 at stem elongation (G.S.5) on June 8. All plots were harvested on August 27 and square meter yields were calculated.

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*Partially funded by Technology Transfer Program ASA II

RESULTS:

TABLE 1 - Response of Spring Wheat to Applications of Nitrogen

NITROGEN TREATMENT kg/ha	YIELD* kg/ha	D.M. %	YIELD(14%M) kg/ha	PROTEIN %	DOCKAGE %
0	3100	78	2800	18.8	3.0
60	3300	77	3000	16.6	2.5
25+35	3400	79	3100	17.2	2.0
mean	3200	78	3000	17.5	2.5

*No significant difference in yield between treatments.

DISCUSSION AND CONCLUSION: It was expected that nitrogen applied at seeding, ie, treatment 2, would partially leach out and not be available later on in the season. Splitting the applications as in treatment 3, did not have any great effect on yield or protein. The high level of manure was releasing nitrogen throughout the entire growing season, as indicated by the high protein contents. This field was regarded as an excellent stand of wheat, and lodging was nonexistent. Other spring cereal could not have stood this high fertility without lodging.

REFERENCE: Walker, D.F. and J. Damboise. Intensive Grain Management Project. Adaptive Research Reports, 1980. Plant Industry Branch, New Brunswick Department of Agriculture and Rural Development. P. 168-172.

GRAIN YIELD SURVEY

BY

C. McLEAN AND J. DAMBOISE

Abstract: Commercial fields of cereals in Carleton, Victoria and Restigouche Counties were surveyed. Barley yields averaged 3000 kg/ha (55 bu/ac) and wheat yields averaged 3050 kg/ha (45 bu/ac).

INTRODUCTION: Cereal production is becoming increasingly important in New Brunswick. Since the Atlantic region has traditionally been a net importer of grain, a market exists for an expanded cereal production. The economics of cereal production have not been conducive to this, largely because of low yields.

Awareness of the benefits of a rotational crop for potatoes has maintained grain as a crop of major significance. Advances in production technology have made the possibility of consistently profitable cereal crops much more realistic.

To determine the relative yield of barley and wheat in New Brunswick, representative fields were sampled; and yield, quality and soil data collected.

MATERIALS AND METHODS: Cereal fields were sampled as the grain was being harvested. Harvested weight was determined by measuring the sample area, and by weighing the combine before and after harvest with portable electronic scales. Grain and soil samples were collected for laboratory analysis at the time of harvest.

RESULTS AND DISCUSSION: Conditions in 1982 were less than ideal for cereal production. Although a large proportion of the crop was planted early, dry conditions led to poor and uneven germination. Growth was consequently slow during the major part of the growing season. Positive aspects of this were that the decreased plant height led to less lodging problems, and that disease infestation was slight due to dry conditions. However, overall yields were reduced by the lack of moisture.

Results are summarized in Table I. Barley yields ranged from 1392 to 4370 kg/ha, averaging 2956 kg/ha; which wheat yields ranged from 2240 to 3820 kg/ha, averaging 3042 kg/ha. There was also a considerable range in soil fertility in the fields sampled.

TABLE I. YIELDS, QUALITY ANALYSIS, AND SOIL FERTILITY OF CEREALS SURVEYED

	Yield kg/ha	D.M. %	Protein %	pH	Soil Analysis			
					P_2O_5	K_2O	Ca	Mg
Barley	2900	83	10.0	6.2	VH	H	L	M
Barley	2500	84	10.2	5.6	VH	H	L	M
Barley	1400	87	10.8	5.6	M	M	L	L
Barley	3200	84	11.9	6.0	H	VH	M	M
Barley	2900	86	11.0	6.5	M	M	M	H
Barley	3400	86	11.1	6.2	VH	VH	M	H
Barley	3000	85	10.8	6.0	VH	VH	H	H
Barley	3000	86	10.4	5.9	VH	VH	M	H
Barley	3100	87	10.9	5.9	M	H	M	VH
Barley	4300	86	11.2	6.3	VH	VH	H	VH
Barley	2600	87	10.4	5.8	M	M	M	H
Barley	2900	85	10.8	6.1	VH	H	M	H
Barley	4400	85	10.7	5.9	VH	VH	M	H
Barley	1800	87	11.8	6.0	M	M	L	M
Wheat	3800	87	11.9	6.0	VH	VH	H	VH
Wheat	3600	86	12.1	6.0	VH	VH	H	VH
Wheat	3000	85	11.5	5.8	VH	VH	M	VH
Wheat	2200	86	11.9	5.9	M	VH	M	M
Wheat	2500	83	12.2	5.8	VH	VH	M	M

CONCLUSIONS: Although growing conditions in 1982 were less than ideal, several of the sampled fields yielded very well. Those planted early had established satisfactorily before the hot, dry conditions prevailed. The wide range in yields reflected here are largely due to management factors such as seeding time and fertility management. With careful consideration of a total management package, cereal production could become much more profitable in New Brunswick.

DEMONSTRATION OF GLEAN HERBICIDE ON CEREAL GRAINS

By

K. J. MacIsaac

Abstract: Glean, a new herbicide for controlling broadleaf weeds in cereals, and licensed for use in Western Canada, was demonstrated in the Moncton area. Weed control compared favourably with other herbicides.

INTRODUCTION: Glean, manufactured by Dupont Canada Inc., is now recommended for weed control in cereals in Western Canada. Pertinent literature suggests that this herbicide controls all broadleaf weeds with the exception of wild tomato, an insignificant pest in both the Prairies and the East. Glean comes in a 500 gram container which will treat 41 to 82 acres. It is a unique dry flowable formulation which can be applied at the two-leaf to flag-leaf stage of wheat or barley. This allows some flexibility around weather conditions. Glean is absorbed by both the leaves and roots of weeds. This two-way killing action controls late maturing weeds. Glean was first available in the Prairies this year, and may be recommended in publication 75, "Guide to Chemical Weed Control" for 1983. It was decided to gain some practical field experience with Glean, in anticipation of availability in 1983.

MATERIALS AND METHODS: Sixteen grams of Glean was obtained from Dupont Canada Inc. Alex Henderson of McDougall Settlement agreed to demonstrate the chemical on Loyolla barley. The herbicide was applied to 1.5 acres at the three-leaf stage, using a conventional sprayer.

RESULTS: Glean was compared to Dyvel and a private mixture of 2,4-D and dicamba. Control was comparable with the other herbicides.

DISCUSSION: The product was mailed in a very small vial similar to a container for prescription medicines, yet the volume was sufficient to cover 1.5 acres. Its high concentration and ease of handling make Glean a very flexible product. It is designed for the western farmer who must spray large acreages without stopping to fill up the sprayer tank. If farmers are to use it successfully, their spraying equipment must be calibrated precisely.

Recently, Dupont has found the soil activity of Glean to be longer lasting than was expected. A combination of high pH, low rainfall, low temperature and high application rates, may not allow a crop other than wheat or barley to be planted the following year.

In 1982, a 500 gram container of Glean cost $320.00 which would treat an average of 56 acres. This cost of $5.70/acre is high in relation to other herbicides. Its effectiveness will determine its future use.

ACKNOWLEDGEMENTS: Thanks are extended to Frank Huston, Dupont representative for the Maritimes, who donated Glean for this demonstration.

DEMONSTRATION OF DYVEL HERBICIDE ON CEREAL GRAINS

BY

K. J. MACISAAC

Abstract: Dyvel herbicide applied to cereal fields at six locations provided excellent control of broadleaf weeds. At the recommended rate of .5L/acre, no crop injury was observed.

INTRODUCTION: Traditionally, the two major cereal herbicides have been 2,4-D and MCPA; 2,4-D controlling lambs quarters, mustards, pigweed, etc.; MCPA controlling hemp nettle in addition to the above weeds. Lately, Kil-Mor (dicamba/2,4-D/mecoprop) has appeared for field bindweed, Canada thistle and perennial sow thistle. In the past year, Dyvel (dicamba/MCPA in a ratio of 1:4) has been recommended for similar hard-to-control weeds. It was felt that the MCPA and dicamba combination might be more effective in controlling hemp nettle, wild buckwheat and corn spurry than the 2,4-D combination with dicamba.

MATERIALS AND METHODS: Twenty litres of dyvel liquid herbicide, manufactured by Velsicol Inc., was obtained from the Pfizer Chemical Co.. Three litres, or enough product for six acres, were distributed to each of the following growers: Hank Braam, Hillsboro; Peter Bunnett, Havelock; Joe Connors, Scoudouc; Tom Dalling, Waterford: Alex Henderson, MacDougall Settlement and Ken Reicker, New Line Road. Dyvel was applied at .5L/acre at approximately the 4-leaf stage.

RESULTS AND DISCUSSION: All growers agreed that Dyvel was as good as, and probably better than, the herbicides they were currently using. Dyvel was compared to 2,4-D at Joe Connors' farm, and was found to control wild buckwheat, which the former missed.

Dyvel was evaluated for control of corn spurry at Ken Reicker's farm. It was applied at a late stage on oats, and reasonable but not permanent, control was noted. When applied at the proper stage on barley, good control was obtained. However, next to a high rate of MCPA very little difference was noted.

SUMMARY: The cost of Dyvel in 1982, was $6.23/litre. Applying .5L/acre implied a cost of $3.10/acre. In addition to being able to control weeds more persistent than lambs-quarters, mustards, pigweeds, etc., Dyvel is certainly price competitive with the common herbicides. No injury to the cereal crop was observed at any location.

ACKNOWLEDGEMENTS: Thanks are extended to Ian Armour, N.B. District Manager for Pfizer Chemicals, who supplied at no cost 20 litres of Dyvel for these trials.

EVALUATION OF AGRONOMIC CHARACTERISTICS OF WINTER CEREALS ACROSS PLANTING DATES AND LOCATIONS

BY

DAVID WALKER AND JOHN MONTEITH

Abstract: Seven winter wheat (Triticum Aestivam L) and three winter rye (Secale Cereale L.) cultivars were evaluated for yield and agronomic characteristics at four locations planted with three dates. Delaying planting reduced yields and spike number. Winter survival was acceptable. Snow mold caused some winter injury.

INTRODUCTION: Winter cereals are an option for grain growers in New Brunswick. Their advantages over spring grains are: a) higher yield; b) erosion reduction; c) excellent harvest and planting conditions; and d) compatibility with existing planting and harvesting schedules.

Three new winter wheat cultivars, Monopol, Vuka and Valor, have been licensed in the past year. Monopol has the potential to produce a milling quality grain while the remaining two are feed wheats. Monopol and Vuka have a high yield potential and excellent straw strength but lack winter hardiness compared to the standard Lennox. Valor is similar to Lennox in most respects, with superior yield and winter survival but reduced lodging resistance.

Winter survival is the major limiting constraint to producing winter cereals. It is not as severe a problem as was once thought, particularly when fields have adequate drainage and protection from desiccating winds.

MATERIALS AND METHODS: Seven winter wheat and three winter rye cultivars were planted at Grand Falls, Florenceville, Sussex and Moncton in the fall of 1981 with a 510 semi-mounted international grain drill. Fertilizer (analysis 5-20-20) was applied with the seed at the rate of 300-400 kg/ha. In the spring, nitrogen was applied as a split application, 35 kg/ha, N, late April and 50 kg/ha, N, mid to late May. Only data from the Florenceville and Moncton locations are reported. The winter wheat cultivars, Lennox, Monopol, Vuka, Norstar, Absolvent, Kormoran and Clement and the rye cultivars Kustro, Kodiak and Animo were planted on three dates at Florenceville, August 27, September 8 and September 22 and on September 1 at Moncton.

RESULTS AND DISCUSSION: Winter survival was excellent at both locations with little difference between cultivars. Any winterkill that did occur was a result of snow mold. The three rye cultivars were effected to a greater extent than the wheat with almost total destruction of all green leaf material on some plots. The crowns of the plants survived and recovered to produce a normal crop.

Average yields (Table I, II) were higher at the Moncton location than at Florenceville. The recommended wheat cultivars, Lennox and Monopol, had the highest yield at Florenceville and Moncton respectively. No one cultivar appeared to be superior in all traits, although Norstar was clearly inferior due to reduced yield, lodging and disease resistance.

Differences in yield between locations can be attributed to dry conditions, a general lack of vigor and fewer spikes per unit area at Florenceville. Other components of yield; kernels per spike; and kernel weight were similar at both locations.

Spike number m^{-2} was much higher at the Moncton location than Florenceville due to a greater number of secondary tillers surviving to maturity.

Percent protein was much higher across all dates at Florenceville than at Moncton. As nitrogen applications were equal, it appears that reduced protein percentage at Moncton was due to protein dilution as a result of higher yields.

Thousand kernel weights and kernels per spike were similar across all dates and locations.

Effect of Planting Dates

Delaying planting date from August 27 to September 8 increased the average yield of the eight cultivars across all planting dates from 3.3 to 3.6 T/ha. A further delay resulted in a drop in yield from 3.6 to 2.7 T/ha.

Walker (1981) reports that delaying seeding date from August 27 to September 19 resulted in a significant and progressive decline in yields and in spikes m^{-2}. This disagreement could have occurred as a result of plot layout in 1982. The August 27 planting date was within the snow shadow of a fence row. The snow trapped behind the fence row covered the August 27 planting date for 10-14 days longer than the other two planting dates. Due to severity of snow mold damage,

Table 1. Comparison of cultivars of winter cereals across three planting dates for yield, winter survival, spikes m^{-2}, percent protein, kernel weight and kernels per spike at Florenceville, 1982.

Parameter	Date	Lennox	Monopol	Vuka	Absolvent	Clement	Norstar	Kormoran	Kustro*	Kodiak*	Animo*
Yield t/ha	1	3.8	3.2	2.5	3.1	2.9	3.1	2.3	5.5		
	2	4.6	3.5	3.4	3.9	3.3	2.9	2.8	4.4	4.9	3.4
	3	3.6	2.3	2.1	3.4	3.1	2.5	2.1	2.2	2.6	1.4
	Mean	4.0	3.0	2.7	3.5	3.1	2.8	2.4	4.0	3.8	2.4
Winter[a] Survival	1	8.0	8.5	8.0	8.0	7.5	7.0	7.5	5.0		
	2	8.5	9.0	8.5	9.0	7.5	7.0	8.5	4.0	8.0	3.5
	3	8.5	9.0	9.0	9.0	8.5	9.0	9.0	5.0	7.0	6.0
	Mean	8.3	8.8	8.5	8.7	7.8	7.7	8.3	4.7	7.5	4.8
Spikes m^{-2}	1	505	353	212	317	244	572	237	401		
	2	448	380	258	372	249	539	356	377	420	366
	3	252	182	141	289	310	237	173	226	254	99
	Mean	402	305	204	326	268	449	255	335	337	233
% Protein D.M. Basis	1	14.2	16.1	14.5	15.6	14.7	16.9	13.8	12.0		
	2	15.9	15.6	15.3	15.9	13.8	16.4	15.2	13.9	12.8	12.8
	3	16.6	16.4	15.8	16.4	14.8	16.9	15.9	14.7	14.7	15.3
	Mean	15.6	16.0	15.2	16.0	14.4	16.7	15.0	13.5	13.8	14.1
1000 Kernel Weight	1	41	34	39	43	33	26	33	28		
	2	42	36	36	46	32	24	33	32	26	33
	3	41	35	37	43	33	26	31	34	31	35
	Mean	41	35	37	44	33	25	32	31	28	34
Kernel #/spike	1	22	27	40	25	37	23	29	44		
	2	27	33	36	29	40	26	34	45	52	42
	3	27	32	39	25	39	28	37	39	49	40
	Mean	25	31	38	26	39	26	33	43	51	41

*Winter Rye.

[1] Planting date - August 27, 1982.

[2] Planting date - September 8, 1982.

[3] Planting date - September 22, 1982

[a] 10 = 100% Survival; 0 = Completely killed.

Table 2. Comparison of cultivars of winter cereals for yield, winter survival, spikes m^{-2}, percent protein, kernel weight and kernels per spike at Moncton, 1982.

Cultivar	Yield t/ha	Winter Survival[a]	Spikes m^{-2}	% Protein	1000 Kernel Weight	Kernels /Spike
Lennox	3.5	9.0	647	15.8	39	26
Monopol	5.1	8.5	433	13.1	36	25
Vuka	4.8	8.5	570	11.9	38	41
Absolvent	4.2	8.5	616	13.3	44	22
Clement	4.7	7.5	523	12.3	38	36
Norstar	2.8	8.5	854	15.9	26	22
Kormoran	5.1	7.5	421	13.0	36	37
Kustro*	5.8	7.0	578	10.3	27	47
Kodiak*	4.9	8.0	466	11.6	25	52
Animo*	6.2	5.5	398	11.7	47	47

Planting date - September 1, 1981.

*Winter Rye.

[a] 10 = 100% Survival; 0 = Completely killed.

spring tillering was reduced and crop development slowed.

Yield of the September 22 planting was low due to reduced spike number. Late planting does not permit adequate time for secondary tiller development in the fall, and tillers that do develop in the spring seldom produce a spike.

CONCLUSIONS: Winter cereals are an alternative for New Brunswick grain producers. Two years of small trial data plus large scale on-farm trials confirm that several cultivars will survive the winter and produce high yields on well-drained protected sites, if planted between the 25 of August and the 5 of September.

It appears that snow mold, particularly in the northern areas of the Province where the snow remains for long periods, could be a greater deterrent to winter survival than desiccation, icing, freezing, flooding or heaving. Snow cover during the winter of 1981-82 was from December 8 to approximately May 1 at Florenceville and from December 18 to April 10 at Moncton.

Conditions for snow mold development appears to be greatest when snow cover remains for long periods, when the previous crop was grain and conditions of excessive crop growth in the fall.

REFERENCES: Walker, D. F., J. Damboise and C. McLean. 1981. Evaluation of Agronomic Characteristics of Winter Cereal Cultivars Across Planting Dates. Adpt. Res. Rept. Plant Industry Branch, N. B. Department of Agriculture. p 203-213.

ON-FARM WINTER WHEAT PRODUCTION*

BY

DAVID WALKER AND BOYD PETERS

Abstract: Lennox winter wheat was grown commercially on ten farms in the major grain-growing area of New Brunswick. With one exception, winter survival was excellent, ranging between 70 and 95%. Average yields and protein were 3.7 T/ha and 13.5% respectively.

INTRODUCTION: Grain growers are interested in producing winter cereals because of high yield potential, ability to reduce erosion and compatibility with existing planting and harvesting schedules.

Grain quality is another positive feature of winter cereals. Most winter cereals naturally have large plump kernels but also have few shrunken and shriveled kernels caused by diseases.

Winter wheat starts growing early in the spring and usually matures earlier than most spring grains minimizing exposure to many diseases.

MATERIALS AND METHODS: Certified Lennox winter wheat was planted in the fall of 1981 by ten farmers in Carleton, Kings and Westmorland counties. Seeding rate was 135 kg/ha and fertility ranged between 300-400 kg/ha of 5-20-20 fertilizer at planting and 100-200 kg/ha of ammonium nitrate in the spring of 1982. The growth regulator Cycocel was tank-mixed with herbicides and applied at two locations. All other management practices were similar to those recommended for spring cereals.

RESULTS AND DISCUSSION: With the exception of one field which had a heavy soil, (not reported in tables), winter survival was excellent ranging from 70-95%. Winter kill was a result of snow mold, not freezing or dessication.

A detailed survey was completed on nine of the ten sites (Table II). The data includes fertility analysis at different levels in the profile, an estimation of the proportion of sand, silt and clay and a textural classification. Most fields were well drained and had adequate fertility, but where poor soil structure caused imperfect drainage, winter survival was not affected due to adequate snow cover during the winter.

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*Partially funded by ASA II Agreement.

Table 1. Yield and agronomic data for winter wheat demonstration production, 1982.

Site #	County	Yield 14.5% H_2O T/ha	Yield 14.5% H_2O Bu./Acre	Harvest Date	% Protein D.M. Basis	Winter Survival
1	Carleton	4.5	66	Aug. 12		95
2	Carleton	4.1	61	Aug. 11	12.3	85
3	Carleton	5.0	74	Aug. 11	13.3	80
4	Westmorland	4.2	62	Aug. 16	12.8	85
5	Kings	3.1	47	Aug. 17	14.7	95
6	Kings	3.3	49	Aug. 17	13.8	80
7	Carleton	2.6	39	Aug. 12		70
8	Carleton	4.0	60	Aug. 5		85
9	Queens	2.8	42	Aug. 16	12.0	85
10	Westmorland	3.5	52*	Aug. 17	15.8	85
		$\bar{x}$ 3.7	$\bar{x}$ 56		$\bar{x}$ 13.5	

*Yield reduced by lodging.

TABLE 2. Detailed Soil Analysis for 1982 Winter Wheat Locations.

Site #	Location	Depth (cm)	Ph	P_2O_5	K_2O	Ca	Mg	% Sand	% Silt	% Clay	Texture	Organic Matter
				lbs/acre								
1	Carleton	0-20	6.8	460+	300+	1440	252	33.8	40.7	25.6	L	1.86
		20-40	5.8	128	184	884	120	21.3	47.0	31.8	CL	.53
		40-60	7.2	78	200	2080	140	30.5	39.0	30.6	CL	.25

Site was well drained, sloped 2-5% east. Root penetration 50 cm. Fertility good, little physical limitation to wheat production.

Site #	Location	Depth (cm)	Ph	P_2O_5	K_2O	Ca	Mg	% Sand	% Silt	% Clay	Texture	Organic Matter
2	Carleton	0-20	5.6	344	156	800	48	49.5	24.0	26.5	SCL	2.55
		20-40	5.5	218	88	400	28	55.5	19.2	25.3	SCL	.81
		40-60	5.7	144	88	988	68	32.5	32.2	35.3	CL	.46
		60-80	5.6	60	48	1000	56	30.0	36.0	34.0	CL	.39

Site was well drained, sloped 5-9% west. Root penetration 60+ cm. pH low, some shale at 48 cm, well structured, high clay content doesn't seem to impose problems with drainage.

Site #	Location	Depth (cm)	Ph	P_2O_5	K_2O	Ca	Mg	% Sand	% Silt	% Clay	Texture	Organic Matter
3	Carleton	0-20	6.0	23	124	3720	100	22.3	42.5	35.3	CL	4.51
		20-40	6.6	7	160	2560	84	29.8	27.5	42.8	C	1.23
		40-60	6.7	5	172	2520	76	24.5	25.2	50.3	C	.67
		60-90	6.8	5	188	2800	80	27.0	27.7	45.3	C	.46

Site was moderately well to well drained, sloped 2-5% east. Root penetration 50+ cm. High clay content, but well structured. Fertility low, but doesn't correspond with yields, could be other factors involved.

Site #	Location	Depth (cm)	Ph	P_2O_5	K_2O	Ca	Mg	% Sand	% Silt	% Clay	Texture	Organic Matter
4	West.	0-20	6.5	124	144	2204	36	45.5	33.2	21.4	L	3.25
		20-40	6.2	92	64	1152	16	48.5	28.9	22.6	L	.74
		40-60	5.8	87	60	1160	32	46.8	28.2	25.1	L	.39

Site was moderately well drained, sloped 5-9% west. Root penetration 45 cm. Fertility medium, becomes compact at 50 cm, some sandstone flags. Site may be subject to droughtiness during extended rain free periods.

Site #	Location	Depth (cm)	Ph	P_2O_5	K_2O	Ca	Mg	% Sand	% Silt	% Clay	Texture	Organic Matter
5	Kings	0-20	5.6	23	88	2312	136	46.8	31.5	21.8	L	3.25
		20-40	5.5	21	36	1004	72	58.8	22.0	19.3	SL	.60
		40-60	5.4	25	52	1120	80	62.5	18.2	19.3	SL	.95

Site was moderately well drained, sloped 2-5% south. Root penetration 50 cm. pH and fertility low, soil was fairly shallow. Site may be subject to droughtiness during extended rain free periods.

Site #	Location	Depth (cm)	Ph	P_2O_5	K_2O	Ca	Mg	% Sand	% Silt	% Clay	Texture	Organic Matter
6	Kings	0-20	7.0	101	76	2224	48	61.0	24.7	14.3	SL	2.83
		20-40	7.6	80	40	1020	8	74.5	12.5	13.1	SL	.18
		40-60	6.8	460+	36	500	12	88.5	1.0	10.6	LS	.11
		60-90	6.9	321	36	640	8	67.5	18.2	14.3	SL	.25

Site was well to excessively well drained, sloped 9-15% northwest. Root penetration 80 cm. pH high, fertility levels moderate. Site may be subject to droughtiness during extended rain free periods. Site may be better suited to winter grains than spring grains.

Site #	Location	Depth (cm)	Ph	P_2O_5	K_2O	Ca	Mg	% Sand	% Silt	% Clay	Texture	Organic Matter
7	Carleton	0-20	5.3	460+	300+	800	164	23.5	48.5	28.0	CL	3.32
		20-40	5.3	131	144	368	56	29.8	46.0	24.2	L	1.09
		40-60	5.4	286	156	308	52	31.3	42.0	26.7	L	1.23

Site was moderately well to well drained, sloped 2-5% east. Root penetration 60 cm. pH low, but fertility good. Little limitation to wheat production.

Site #	Location	Depth (cm)	Ph	P_2O_5	K_2O	Ca	Mg	% Sand	% Silt	% Clay	Texture	Organic Matter
8	Carleton	0-20	6.0	460+	188	960	256	35.0	39.5	25.6	L	2.41
		20-40	5.7	300	128	292	68	26.5	44.2	29.3	CL	.88
		40-60	5.5	435	136	224	40	31.3	38.2	30.6	CL	.32
		60-90	5.4	275	144	416	56	22.3	47.2	30.6	CL	.18

Site was well drained, sloped 5-9% east. Root penetration 50 cm. Some slate at 60 cm. Higher content of clay may increase water holding capacity and reduce potential for droughtiness.

9 Queens No data collected.

Site #	Location	Depth (cm)	Ph	P_2O_5	K_2O	Ca	Mg	% Sand	% Silt	% Clay	Texture	Organic Matter
10	West.	0-20	6.8	344	168	2456	76	64.5	16.5	19.1	SL	2.90
		20-40	6.6	89	100	944	24	78.0	1.7	20.3	SCL	.81
		40-60	5.9	57	64	888	40	59.5	16.5	24.1	SCL	.01
		60-90	5.2	73	44	880	120	59.0	17.0	24.1	SCL	.01

Site was imperfectly drained, sloped 0-2% south. Root penetration 50 cm. Drainage impeded at 45 cm, water does not seem to be moving vertically to the tile. Site may not be well suited to winter cereals.

The average yield obtained was 56 bu with a range from 39-74 bu/ac. (Table I). Yield differences were due to management factors with planting date, time of spring nitrogen application, seeding rate and weed control most important.

Fields were planted from late August to mid-September. Producers who planted before September 1 achieved 60 bu/a or above, including the highest yield of 74 bu/ac.

Time of application of spring nitrogen was a major factor determining yield. Several co-operators did not apply the first application until 8-10 of May - approximately three weeks too late for optimum yield.

Originally, weed control was thought to be a minor problem. This is not the case, as grasses, (timothy and quack grass) were a problem. If the grass stand is lush, it is recommended that producers use Roundup prior to planting. Fields should be examined for broad leaf weeds prior to May 15 and control measures taken.

Lodging was not a problem in this test. The recommended cultivar, Lennox, is subceptible to lodging. Lodging can be reduced with the growth regulator cycocel. An application of 1 litre/ac of cycocel just at or prior to stem elongation (approximately May 15) will shorten, increase the diameter and stiffen stems reducing lodging. Most herbicides and cycocel can be tank-mixed making one pass over the field do both operations. Tramlines are not required for cycocel application as it is applied at the start of stem elongation.

CONCLUSIONS: All co-operators were impressed with the winter survival and yield. Most have increased their acreage planted this fall. Co-operators agreed that yields could be substantially increased as a result of experience gained this year. Better management would include applying nitrogen fertilizer earlier in the spring, in some cases, planting earlier in the fall, control of annual and perennial weeds and better land preparation.

Winter kill can occur as a result of snow mold, dissication, freezing or heaving, these conditions can occur individually or in combination and therefore winter survival is the major concern in growing winter cereals.

ACKNOWLEDGEMENTS: The authors appreciate the co-operation of the farmers who supplied equipment, labor and land for this trial.

YIELD AND AGRONOMIC CHARACTERISTICS OF WINTER RAPESEED GROWN IN NEW BRUNSWICK

BY

DAVID WALKER

Abstract: Four winter rapeseed cultivar were planted at the Agriculture Canada Research Station, Fredericton, to evaluate winter survival yield and other agronomic characteristics.

INTRODUCTION: Winter rapeseed is a new crop for Canada with only limited commercial acreage planted in Ontario for the first time in 1982. The major area for winter rapeseed in the world is in Western Europe and in the Soviet Union. It is grown mainly for its oil, however, the meal byproduct is fed to livestock. Winter rape is preferred to spring rape because of its higher yield potential.

Rapeseed (high erucic and high glucosinolate) oil is used as a feedstock for pliable plastics, as a marine oil and in the steel and paint industry. The market is small and therefore areas with a large production are not interested in growing rapeseed due to contamination problems with Canola. New Brunswick is ideally suited to produce rapeseed as it is close to a port for shipping and our production base is small.

The suggested initial price per tonne is between $350-$400. This price could be high enough to stimulate spring rape production.

METHOD: Four winter rapeseed cultivars were planted at the Fredericton Research Station on August 23, 1981 in a replicated randomized block design. Fall fertilizer application was 400 kg/ha of 5-20-20 with an additional 300 lbs. of ammonium nitrate being applied as a split application in the spring of 1982.

Table 1. Yield and agronomic characteristics of four winter rapeseed varieties grown in New Brunswick in 1981-82.

			Lab Analysis						
Cultivar	Yield* kg/ha (Bu./A)	Percent Winter Survival	Percent Dry Matter	Percent Protein D.M. Basis	Ca	P_2O_5	Erucic Acid Content	Gluco-sinolate Content	Country of Origin
	0% H_2O								
Brinks	5050 (90)	73	87	21.3	.35	.63	Low	High	Sweden
Herkules	5400 (108)	80	89	19.4	.45	.48	Low	High	Sweden
Jet Neuf	5150 (92)	72	89	18.4	.48	.53	Low	High	France
WIR4445	5000 (89)	76	85	19.7	.45	.46	High	High	U.S.S.R.

*Yields are extremely high which could, to a certain extent, be due to border effect. The individual plot size was 4½ m x 4 rows x 17.8 cm, seeded in a solid stand (only normal row width between plots) with guard rows on the side border of the plots. Therefore the only border effect would be at the ends. These data give a true reflection of the potential of the crop.

RESULTS AND DISCUSSION: Winter survival was excellent ranging between 70 and 80 percent. Any plants that did not survive were weak and unthrifty and would not have survived within crop competition the following spring. The winter of 1981-82 was extremely easy on overwintering crops and could explain why winter survival was not a problem. However, it is expected that in future, winter survival will be the determining factor as to whether winter rapeseed becomes a commercial crop in New Brunswick. Yields ranged from 5,000 - 5,400 kg/ha (89-108 Bu./A), extremely high for any oilseed crop (Table 1). These same varieties in Ontario produced between 2500 - 3000 kg/ha (45-55 Bu./A).

The crop requires a long establishment period, therefore, it should be planted between August 15th to the 20th. This provides total ground cover by late fall. The following spring, growth starts as soon as the snow is gone, develops the first flowers by May 20, and is ready to harvest by late July. After winter survival, harvesting is the second most critical stage of the production cycle. Rapeseed tends to shatter as it reaches maturity and can cause losses of up to 50%. Swathing 6-10 days prior to combining will reduce shattering losses.

CONCLUSION: Initial data indicates that winter rapeseed has the potential to survive and produces high yield when grown in New Brunswick. These initial findings should be verified, in addition a large scale project to determine planting date, seeding rate and the best method for harvesting should be undertaken.

ALFALFA CULTIVAR YIELD EVALUATION

By

STEPHEN CLARE

Abstract: Four alfalfa cultivars were evaluated for yield and regrowth in the seedling year.

INTRODUCTION: New cultivars of alfalfa are tested by the Atlantic Forage Crop Advisory Committee to assess adaptation to Maritime growing conditions. The Committee will recommend that farmers grow improved varieties as they become available.

Apica alfalfa (Secan) is a Flemish-type alfalfa (early maturing with fast regrowth) bred by the Universit/ Laval. It has been identified as having good winter survival and will be available and recommended for use in 1984.

Prowler alfalfa (King Grain) is a creeping rooted alfalfa not yet available in Canada.

To demonstrate the respective production and winter hardiness of these varieties compared to the standard varieties Saranac (early) and Iroquois (medium), a cultivar evaluation test was planted at four locations in New Brunswick.

METHODS: Small replicated plots of Apica, Iroquois, Prowler and Saranac alfalfa were planted at Fredericton, Anagance, St. Quentin and Charlo. Seeding rate was 10 kilograms innoculated seed per hectare. Lime and fertility were to recommended levels. The established plots were harvested at bloom (82 08 23) by a Swift Current plot harvester. Subsamples were used to determine dry matter production.

RESULTS: Three of the four locations were lost due to weeds, dry weather and erosion respectively. Yields obtained at the remaining site, Fredericton, were not significantly different. Regrowth of Apica was greatest of the four as expected from its Flemish ancestory.

Winter survival and yield will be recorded for the next two-three years. Tests will be re-established in other parts of the Province.

TABLE I. YIELD* AND REGROWTH OF FOUR ALFALFA VARIETIES IN THE SEEDLING YEAR AT FREDERICTON

	Yield**	Regrowth***
Prowler	5850	2.5
Iroquois	5530	4.5
Apica	5120	5.0
Saranac	5000	4.5
Mean	5375	4.1

* kg/ha dry matter.
** Not significant differences.
***Relative rating.

NOTE: The assistance of Roger Theriault, New Brunswick Department of Agriculture and Rural Development, Bathurst; Isaac Breau, New Brunswick Department of Agriculture and Rural Development, Dalhousie; and Pat Ouellet, New Brunswick Department of Agriculture and Rural Development, St. Quentin, is recognized.

ALFALFA PRODUCTIVITY - ON-FARM PRODUCTION

BY

STEPHEN CLARE

Abstract: Yields of alfalfa-grass mixtures were sampled in farmers fields in two areas of New Brunswick.

INTRODUCTION: While it has been established that alfalfa will grow in all parts of New Brunswick, farmers are reluctant to grow the crop. Farmers and extension personnel have cited the lack of reliable yield data as a factor contributing to the poor acceptance. This study measured production on farmers' fields by sampling a small section of the field.

METHODS: A flail forage plot harvester was used to sample forage growth prior to the farmer harvesting his crop. Three samples (.68 x 5 m) were taken per field, wet weight recorded and subsamples taken for dry matter and nutrient determination.

RESULTS AND DISCUSSION: The mean yield of 7.0 tonnes/ hectare (Table I) is similar to previous yields reported on New Brunswick forage. The actual amount of forage stored by the farmer would be less due to losses in harvesting. The relatively low yields of the first cut compared to the second cut reflect the cool spring growing season in New Brunswick. The results of the Northwest first cut only data are higher than the Northeast first cut only for two reasons: stands in the Northwest are younger (first full year of production); and those stands in the Northeast on which first cut only data is reported were poor stands.

Further results of the Northwest fields are reported elsewhere in this publication.

NOTE: The assistance of Roger Theriault, New Brunswick Department of Agriculture and Rural Development, Bathurst, and Hubert Cyr, New Brunswick Department of Agriculture and Rural Development, Edmundston, is recognized.

TABLE I. ON-FARM YIELD[1] OF ALFALFA-GRASS MIXTURES IN NEW BRUNSWICK

Co-operator	Cut 1 07 05[2]	Cut 2 08 20	Total
1	3.0	3.9	6.9
2	3.5	3.3	6.8
3	3.5	3.2	6.7
4	3.0	3.5	6.5
5	3.3	5.6	8.9
6	3.7	3.5	7.2
7	2.7	2.6	5.3
8	4.4	3.2	7.6
Mean	3.4	3.6	7.0

[1] Tonnes/hectare dry matter.

[2] Harvest date.

TABLE II. FIRST CUT YIELD[1] OF ALFALFA-GRASS MIXTURES IN NEW BRUNSWICK

Northeast			Northwest	
Co-operator	Yield 07 05[2]	Variety	Co-operator	Yield 06 23
9	2.9	Naragansett	1	3.0
10	2.7		2	3.5
11	3.3		3	3.5
12	2.9	Saranac	2	3.0
13	2.5		3	3.3
14	1.9	Anchor	1	3.1
Mean	2.7			3.2

[1] Tonnes/hectare dry matter.

[2] Harvest date.

ALFALFA - TIMING OF POTASH APPLICATION

BY

STEPHEN CLARE

Abstract: Potash was applied to established alfalfa fields at the rate of 300 kilograms per hectare per year. Effect of the timing of the application on yield and tissue content is reported.

INTRODUCTION: Farmers normally apply potash after second cut to ensure availability of potash to their alfalfa over winter. As alfalfa is also fertilized in the spring, it would be possible to supply potash then, saving the cost of the second application. This study was established to assess the effect of time of application on yield and tissue content of alfalfa.

METHODS: Potash was applied as 0-0-60 in early spring, after first cut, and after second cut to established alfalfa fields in three locations (Table I). Yield was assessed by small plot harvester in June and August. Tissue analysis were taken from summer growth.

RESULTS AND DISCUSSION: No effect was observed on yield (Table I). Contrary to some reports suggesting that alfalfa will take up unnecessarily high levels (luxury consumption) of potash if it is available, the level of potash in the tissue was not correlated to the level of fertilizer applied.

Plots will be assessed in succeeding years for winter survival and yield.

Recognition: The assistance of Messrs. Waterston, Caile and Antworth in providing land for this trial is recognized.

TABLE I. YIELD[1] AND POTASH LEVEL[2] OF ALFALFA UNDER SEVERAL POTASH FERTILITY REGIMES IN NEW BRUNSWICK

Treatment	Yield			Potash Level		
	Site 1	Site 2	Site 3	Site 1	Site 2	Site 3
Sp[3] Su Fa						
100[4]+100+100	1725	1250	1525	2.4	1.7	2.8
200+ 0 + 100	1800	1575	1560	2.5	1.4	3.2
300+ 0 + 0	1620	1490	1510	2.4	2.1	3.1
Check	2230	1455	1650	2.5	1.5	2.9

[1] kg/ha

[2] percent of plant tissue dry matter

[3] Sp - spring
Su - summer - after first cut
Fa - fall - after second cut

[4] kg/ha of actual potash

ALFALFA PHOSPHATE FERTILITY AT PLANTINGS

BY

STEPHEN CLARE

Abstract: Phosphorous was applied at five rates to alfalfa fields before planting. The effect of the varying levels of phosphorous on yield and tissue content are reported.

INTRODUCTION: Phosphorous is required by seedling plants to develop a healthy root system. Poor establishment of alfalfa may be due to low levels of available soil phosphorous. This test evaluates the effect of excess phosphorous applied to alfalfa land prior to seeding.

METHOD: Phosphorous (P) was added to soil as 0-46-0 and incorporated prior to seeding alfalfa in May 1982 at Tay Creek, New Brunswick. Phosphorous was applied at the rates of 30, 50, 100, 150 and 200 kg/ha of actual P. Potash and baron were applied at the recommended rate.

Yield was assessed by small plot harvest using three replications on 08 20 at early bloom. Tissue analyses were performed on samples of pure alfalfa.

RESULTS: Yield was not affected by application of phosphorous in the seeding year (Table 1). The level of phosphorous in the plant tissue increased with amount of fertilizer applied. The stand will be assessed for winter survival and yield in successive years.

RECOGNITION: The author wishes to recognize the assistance of the Central New Brunswick Soil and Crop Improvement Association and Tay Farms for the provision of land.

TABLE 1. Yield of alfalfa under five phosphorous fertility regimes in the seedling year.

P Applied P (kg/ha)	Yield gm/plot	Tissue P (% D.M.)
30	530	.26
50	670	.29
100	520	.31
150	600	.33
200	650	.32
MEAN	600	.30

AGRONOMIC EVALUATION OF NO-TILL PLANTED CORN

BY

STEPHEN CLARE

Abstract: The results of a John Deere No-Till Corn Planter are assessed for yield and agronomic characters.

INTRODUCTION: The short growing season of New Brunswick could be extended by the use of no-till planting methods. This would allow planting to take place approximately one week earlier on spring ploughed fields. Corn planted by both no-till and conventional methods was evaluated for yield and agronomic characteristics.

METHOD: A section of a spring ploughed field that had previously been in corn was left for use with a John Deere No-Till Corn Planter. The planter was used on the whole field with uniform fertilizer and seeding rates giving the same date of planting for both conventional and no-till corn. Hen manure had been applied to the field and was incorporated only on the ploughed ground. Five samples of 2.2 metres of row were harvested and agronomic data taken just prior to harvest.

RESULTS AND DISCUSSION: Higher yields (significantly) were obtained with the conventional method of planting when both conventional and no-till planting took place the same day. The greater yield of the conventional planting is due to a higher number of heavier ears with a mean weight of 103 verus 87 grams of dry corn per ear. Some of the difference in ear size can be attributed to the increase in availability of nutrients through incorporation of the manure. Yield and population differences may be caused by cooler soils under no-till resulting in slow early growth.

The extremely high plant population contributed to small ears and stalks. Stalk quality was similar (3.5% broken) for both treatments.

No differences in insect damage were noted. Weed control appeared better on the conventional-tilled plot.

Results from this trial are similar to reports from other areas where a yield disadvantage is attributed to no-till planting. The no-till planter would be useful in a late spring when the farmer could plant directly allowing him to plant approximately five days earlier than if he had ploughed and cultivated.

Recognition: The assistance of C. E. Everett, Engineering Branch, New Brunswick Department of Agriculture and Rural Development, at planting and the provision of time, labour and land by L. Jewett are recognized.

TABLE I. YIELD[1] AND POPULATION[2] OF CORN PLANTED BY NO-TILL AND CONVENTIONAL METHODS IN NEW BRUNSWICK IN 1982

	Plants	Cobs	Kernel Dry Wt.	% Mo.[4]	Ear Dry Wt.	% Mo.
No-till	76000a	64000a	5570a	39	7170a	46
Conventional	83000a	72000a	745 b	36	9300 b	41

[1] kg/ha

[2] per hectare

[3] figures within a column followed by the same letter are not significantly different.

[4] at harvest.

A PRELIMINARY REPORT ON TWO IMPROVED VARIETIES OF RED CLOVER*

BY

K.J. MACISAAC

Abstract: Stands of Common Double Cut Red Clover and two improved varieties of red clover, Florex and Prosper I, were established in 1982. They will be evaluated for persistance over the next 2-3 years, by measuring yields and analysing the forage.

INTRODUCTION: Red clover is a widely adapted short rotation legume, useful for stored feed production. It is slightly lower in feed value than alfalfa (19% vs 21% crude protein at late bud) at comparable stages of development. Red clover is better adapted to variable drainage and to a lower soil pH than alfalfa. Traditional Double Cut Red Clover varieties such as Dollard, Ottawa, and Lakeland seldom last longer than two years. This short term persistence is caused by diseases such as powdery mildew, Northern anthracnose, crown and root rots. Currently, two varieties, Florex and Prosper I (Northrup King and King Grain Co., respectively), are showing slightly better disease resistance and are persisting longer in the stand. This trial was initiated to compare the persistence of these two varieties with that of Common Double Cut Red Clover.

MATERIALS AND METHODS: A demonstration site was obtained at the farm of Garnett Salter in Salisbury. The soil tested - pH 5.6, P_2O_5 121, K_2O 156, Ca 1820 and Mg 128. 2.5 tons/acre of lime were applied in addition to a heavy application of dairy manure in the fall of 1981. 300 lb/acre of 0-20-20 were broadcast in the spring of 1982. The preceding crop was timothy. 2.5 acres were seeded with Florex at 16 lb/acre. 3.1 acres were seeded with Prosper I at 13 lb/acre. 3.0 acres were seeded with a mixture of 80% Canada #1 Double Cut Red Clover and 20% Climax Timothy at 13 lb/acre. All varieties were direct seeded with a brillion cultipacker type seeder on June 9.

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*Partially funded by Technology Transfer Program ASA II

RESULTS AND DISCUSSION: No chemical weed control was used and as a result lamb-quarters and hemp nettle were very numerous before clipping. After clipping in August, the second growth was much more uniform, giving the field an excellent appearance going into the winter. Although the season was dry, this trial was located on a heavy soil which retained moisture well and stress was not a problem. Yields will be measured and the forage analyzed in 1983 and 1984.

REFERENCE: Fulkerson, R.S. 1982. Red Clover for Feed, Seed and Soil-Publication 221, Ontario Ministry of Agriculture and Food.

NORTHWEST FORAGE YIELD SURVEY 1982

BY

J. DAMBOISE, H. CYR, P. OUELLET

Abstract: On-farm yield surveys were taken on pure stands of alfalfa and timothy and on some forage mixtures in the two main forage producing areas of the Northwest Region of New Brunswick. Pure stand of alfalfa produced the greatest concentration of protein. The advantages of proper cutting date were demonstrated.

INTRODUCTION: There is an increased awareness of the importance of producing high quality forage to increase the productivity of livestock enterprises, reduce feed costs and maintain a competitive position.

The Northwest Region of New Brunswick is presently devoting an average of 6.5 acres of land per cow for forage production (Statistics Canada, 1981 Census). An improvement in yield and quality could decrease the land base requirement for forage to 2.0 acres per cow or less. Surplus acreage now devoted to forage production could be utilized to produce small grains, or a cash crop.

Alfalfa acreage has increased and now accounts for approximately 8% of the cultivated forage crop land (Statistics Canada). The choice of proper species is important for yield and quality improvement but must be part of an entire forage production management package.

Forage yield was surveyed on conventional forage mixtures (triple mix), alfalfa-based mixtures, and on pure stands of alfalfa and timothy to assess the performance of each.

MATERIALS AND METHOD: The farms selected for the forage yield survey were involved with the two major forage production improvement projects; Northwest forage project (Madawaska Co.) and Northeast forage project (St. Quentin area).

The forage yield of dry hay was determined by taking the average bale weight and the bale count for the field. When harvested for haylage, the yield from a measured area was surveyed. Soil and forage samples were taken from each site surveyed, for laboratory analysis. Only the first cut was surveyed. This varied from July 3 to July 7 in Madawaska County and from July 8 to July 12 in the St. Quentin area.

Second cuts were taken on all stands and a third cut on one pure stand of alfalfa but were not surveyed.

A survey was also done (June 22nd) prior to the Madawaska alfalfa first cutting date with a small plot harvester to determine the effect of cutting dates on yield and quality of alfalfa.

RESULTS AND DISCUSSION: Alfalfa yielded more dry matter and protein per hectare in Madawaska County than the St. Quentin area (Table I). The St. Quentin alfalfa stands were one year older and were partially damaged by the 1980-81 winter. The winter killed alfalfa was replaced by weeds (i.e. dandelion and quack grass). Some problems with weed control prior to establishing alfalfa had been experienced in the St. Quentin area. Some farmers waited until after early bloom to harvest. decreasing the levels of TDN and protein in their alfalfa. Protein levels of alfalfa were also decreased where the weed population was high. Soil fertility, especially phosphorus, could be improved on most alfalfa sites.

The first survey done on the Madawaska alfalfa project on June 22nd shows that the alfalfa was not yet ready for cutting (pre-bloom) at that date. Both yield and quality would have been reduced if the alfalfa had been cut at that stage (Table IV).

The forage mixture protein levels (Table II) vary with the legume population remaining in the stand. Protein yields per hectare are comparable to the poorly established alfalfa stands (Table I) but lower than the well established pure timothy stands (Table III).

Timothy yield (Table III) varies with soil fertility and protein levels are closely related to the yields. In general, higher dry matter yields had a lower protein content but produced more protein per hectare.

CONCLUSION: This survey confirms that high yielding quality forage can be produced in the Northwest Region of New Brunswick. Yield could be increased if management was improved.

ACKNOWLEDGEMENTS: The authors wish to thank Stephen Clare, Forage Specialist, and John Monteith, Field Crop Technician, for their assistance on the June 22nd yield survey.

TABLE I. NORTHWEST ALFALFA YIELD AND QUALITY SURVEY 1982 - FIRST CUT

TABLE 1. NORTHWEST ALFALFA YIELD AND QUALITY SURVEY 1982, First Cut.

FARM	VARIETY	ESTABLISHMENT YEAR	YIELD D.M.	PROTEIN C.M.	PROTEIN YIELD	TDN	SOIL FERTILITY				
							pH	P	K	Ca	Mg
			T/ha	%	t/ha	%	rating				
1	Saranac	81	4.2	19.7	.8	63	6.7	L	M	VH	M
1	Narragansett	81	5.9	21.3	1.3	65	6.3	M	M	H	M
2	Saranac	81	5.6	18.1	1.0	57	6.7	L	L	M	H
2	Narragansett	81	4.5	19.5	.9	59	6.9	L	L	M	H
Mean Madawaska:			5.1	19.6	1.0	61					
3	Iroqucis	80	3.4	14.7	.5	66	6.7	L	VH	VH	VH
4	Iroquois	80	3.7	19.1	7	59	6.5	VH	VH	H	VH
5	Saranac	80	2.3	14.8	.3	60	6.1	VH	VH	M	VH
6	Saranac	80	2.5	15.3	.4	58	6.2	L	VH	H	VH
Mean St. Quentin area:		80	3.0	16.0	.5	61					

TABLE II. NORTHWEST FORAGE MIXTURE YIELD AND QUALITY SURVEY 1982 - FIRST CUT

TABLE II: NORTHWEST FORAGE MIXTURE YIELD AND QUALITY SURVEY 1982, First Cut.

FARM	MIXTURE SPECIES	ESTABLISHMENT YEAR	YIELD D.M.	PROTEIN D.M.	PROTEIN YIELD	TDN	Soil Fertility				
							pH	P	K	Ca	Mg
			t/ha	%	t/ha	%	Rating				
1	T/R/S**	81	2.7	15.6	.4	59	6.2	M	M	M	VH
2	T/R/S	79	3.9	11.9	.5	56	6.1	L	M	M	VH
3	A/T	80	2.6	12.7	.3	63	6.7	H	VH	VH	VH
4	A/T/R/S/B	80	2.6	15.9	.4	60	6.4	M	VH	H	H
Mean:			3.0	14.0	.4	59.5					

*Species: A-alfalfa; B-brome; R-red clover; S-alsike; T-timothy

**Located in Madawaska county, #2,3 and 4 were located in St. Quentin area.

TABLE III. NORTHWEST TIMOTHY YIELD AND QUALITY SURVEY 1982 - FIRST CUT

TABLE III. NORTHWEST TIMOTHY YIELD AND QUALITY SURVEY 1982, FIRST CUT.

FARM	VARIETY	ESTABLISHMENT YEAR	YIELD D.M. t/ha	PROTEIN D.M. %	PROTEIN YIELD t/ha	TDN %	Soil Fertility pH	P	K	Ca	Mg
							Rating				
[illegible]	Toro	81	3.3	13.[illegible]	[illegible]	[illegible]	[illegible]	M	[illegible]	M	[illegible]
	Champ	81	2.2	11.9		[illegible]	[illegible]	[illegible]	[illegible]	M	
	Climax	81	2.8	12.[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	
[illegible]	Drummond	81	2.7	11.4	[illegible]		[illegible]		[illegible]	[illegible]	
2	Champ	81	6.4	9.1	.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Climax	81	5.7	10.6	[illegible]	[illegible]		[illegible]	[illegible]	M	
[illegible]	Drummond	81	5.6	11.1	.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Mean:		81	4.1	11.4	.5	59					

TABLE IV. EFFECT OF DATE OF CUT ON TWO ALFALFA VARIETIES YIELD AND QUALITY

Farm	Variety	Yield kg/ha, D.M.B.		Protein % D.M.B.		TDN %	
		06 22	07 03	06 22	07 03	06 22	07 03
1	Saranac	3.0	4.2	19.3	[illegible]	58	[illegible]
2	Saranac	3.3	5.6	17.8	18.1	52	57
1	Narragansett	3.5	5.9	18.9	21.3	59	65
2	Narragansett	3.5	4.5	16.7	19.5	51	59
Mean:		3.3	5.1	18.2	19.6	55	61

FORAGE YIELD SURVEY

BY

STEPHEN CLARE

Abstract: Data from the second year of an on-going, on-farm evaluation of forage production is reported.

INTRODUCTION: Previous surveys of on-farm yields (1976-80) reported forage crop yield on an annual basis. This study was started in 1981 to establish the productivity of a legume over the life of the stand.

METHOD: Yield of alfalfa-grass mixtures on fields of four selected farms was monitored as to the actual amount of material stored by the farmer in 1981 and 1982. This will be continued for the three or four years of actual production of the stand. One farm was dropped from 1981. Farms were selected on the basis of climate, soil and location with the assistance of the New Brunswick Soil and Crop Improvement Association.

RESULTS AND DISCUSSION: The increase in mean yield (Table I) from 1981 to 1982 is due partially to the increase in farm 2 which was established in 1981.

Dry weather and a late first cut lowered yields of farm 3. The dry period may have decreased yields of fields 3, 4 and 5 as root penetration was limited (Table III). Low soil fertility did not appear to limit yield of field 5.

The autumn of 1982 was late and open, with no permanent snow cover by December 1st. This allowed all legumes time to regrow and form sufficient root reserves if soil fertility was not limiting.

This study will be continued in 1983.

Recognition: The author wishes to recognize the assistance of Kevin MacIsaac and Boyd Peters in collection of this data and the co-operation of the farmers taking part in this survey.

TABLE I. YIELD* OF ALFALFA-GRASS MIXTURES ON SELECTED FARMS IN NEW BRUNSWICK IN 1981 AND 1982

Co-operator	Year of	Yield		Protein		TDN	
#	Establishment	81	82	81	82	81	82
2	81	6.0	6.9	.96	1.0	3.9	4.2
3	80	7.6	6.4	1.00	1.0	4.6	3.8
4	80	10.1	8.0	1.85	1.3	6.3	5.0
5	80	6.8	9.8	.98	1.4	4.2	6.4
x		7.6	7.8	1.19	1.18	4.8	4.9

*tonnes per hectare - dry matter

TABLE II. SOIL FERTILITY OF ALFALFA-GRASS MIXTURES ON SELECTED FARMS IN NEW BRUNSWICK

Co-operator #	pH	P	K	Ca	Mg
2	6.7	VH	M	M	L
3	6.3	H	L	H	L
4	6.6	H	H	H	M
5	5.8	L	L	M	L

TABLE III. SOIL DESCRIPTION OF ALFALFA-GRASS MIXTURES ON SELECTED FARMS IN NEW BRUNSWICK

Co-operator #	Soil Type	Slope	Description
2	Sandy Loam	Almost level to slight	- stone free - well to excessively drained - potential drought - roots extended past 110 cm
3	Loam	2-5° West	- well drained - compact layer at 80 cm impedes roots
4	Loam	5-9° South	- potential spring drainage problems - compact layer at 55 cm impedes roots
5	Loam	2-5° North	- stoney - well to excessively drained - bedrock at 60 cm - limited root growth below 40 cm

FORAGE QUALITY FORECAST - SOUTHEASTERN REGION

BY

K. J. MACISAAC AD R. E. MCQUEEN

Abstract: A Forage Quality Forecast was announced each day for farmers in the Sussex area. The growth stage of several forage species and the percent digestability were given.

INTRODUCTION: One of the fundamental methods of improving forage quality is early cutting. As cutting dates are delayed, maturity is advanced, and digestability of the forage declines.

The Forage Quality Forecast provided two major pieces of information to farmers. It gave the stage of growth for a particular crop on a certain date, and also the percentage digestability associated with that growth stage.

The forecast ran for four weeks from June 14th to July 9th, during the major period of forage harvest. It was updated three times per week for two timothy cultivars: Climax, mid-season; Toro, early, for alfalfa and for red clover.

Fields in the Sussex area were sampled by the crops specialist to determine the growth stage, and digestability was in turn prediced by the nutritionist.

The information was given over CJCW radio station daily at 7:30 a.m. following the Farm Report. It was also published weekly in the Kings County Record.

RESULTS: Table I illustrates the data obtained by observing the same fields for four consecutive weeks. The alfalfa was a medium variety (Iroquois) and the red clover was likely common double cut. Alfalfa maturity was, in general, later this year due to cool spring weather, and may have been even later in this specific field. The first week in July, being extremely hot and dry, quickly forced the red clover into bloom. This maturity was advanced by stress as red clover has a shallow root system for obtaining water.

TABLE I. WEEKLY FORAGE QUALITY

	Date	Growth Stage	% Digestability
Alfalfa	June 14	Buds Swelling	74
	June 21	Early Bud	70
	June 28	Late Bud	70
	July 5	5-10% Bloom	66
Climax	June 14	Late Joint	73
	June 21	Heads Emerged	66
	June 28	10% Headed	63
	July 5	Full Head, No Bloom	60
Toro	June 14	Early Boot	68
	June 21	Heads Emerged	66
	June 28	90% Headed	63
	July 5	Full Head, No Bloom	60
Red Clover	June 14	Buds Swelling	73
	June 21	1% Bloom	71
	June 28	60% Bloom	67
	July 5	Full Bloom	61

CONCLUSION: Acceptance of this project was good, but it did take a short period of time for farmers to realize this information was available and being broadcast. This data should be characteristic for most farms in the Sussex area, but specific fields could differ.

TREFLAN FOR WEED CONTROL IN SEEDLING ALFALFA*

BY

K. J. MACISAAC

Abstract: Treflan, applied at a rate of 2 L/hectare, preplant incorporated, gave excellent weed control in a pure stand of Iroquois alfalfa. Shepard's purse was the only remaining weed and no crop damage was noted. Application of treflan to an alfalfa field is difficult to co-ordinate.

INTRODUCTION: At present, little chemical weed control is used on alfalfa. Clipping, or mechanical weed control, is most common. The spraying done is largely post emergence using Embutox E at the second to third trifoliate leaf stage. Embutox E is a relatively weak herbicide controlling few weeds other than lambs' quarters.

In fields where corn has been grown for several years, annual grasses begin to creep in after atrazine has removed many of the perennials. No post emergence herbicide will remove these grasses in legume forage stands. The only control is a preplant incorporated herbicide before seeding.

Eptam and treflan herbicides require preplant incorporation techniques with which few livestock farmers are familiar. In addition, these chemicals can be used only on pure stands of alfalfa since a grass component would be killed. Both herbicides must be incorporated with a disc as they form a gas in the soil, which kills susceptible seedlings as they germinate. These herbicides cannot be incorporated too deeply or they will be out of range of germinating weed seedlings. They must be incorporated immediately after spraying, as the sun's ultraviolet rays cause rapid degradation. The soil should be dry, as moisture will cause the gas to form immediately and diffuse into the atmosphere.

MATERIALS AND METHODS: A demonstration field was obtained at Lutescroft Farms in the Moncton area. Corn had been grown in this field for the past several years. Since Lasso or Bladex had not been used the previous year, it was anticipated that crabgrass and barnyard grass might become a problem if alfalfa was established in 1982.

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*Partially funded by Technology Transfer Program, ASA II.

Treflan was applied preplant incorporate (PPI) at .8 litres/acre to three acres on May 19th. A conventional three-point hitch sprayer was used on one tractor, while a larger tractor followed behind with a tandem disc. To make the sprayer boom the same width as the disc, pieces of plastic bags were inserted inside the nozzle on each end of the boom. Because of the shape of the field, it was not disced a second time at right angles. A check strip was left for comparison.

Iroquois alfalfa was direct seeded on May 20th at the rate of 15 lb/acre using a Brillion cultipacker. 400 lbs./acre of 5-20-20 were broadcast on a soil with pH 6.1, P_2O_5 460+, K_2O 300+, Ca 1844 and Mg 284.

RESULTS AND CONCLUSION: Excellent conditions were prevailing on the day of trial establishment. A warm sun provided a soil surface that was neither too wet nor too dry. The alfalfa emerged with no sign of crop injury. Excellent weed control was obtained with the exception of Shepard's Purse.

A farmer must be well equipped to apply this herbicide correctly. The weather must be co-operative, with the soil in proper shape. The sprayer must be calibrated and ready to work. An additional tractor must be available to pull a disc. The disc must be operated at precision depth. The sprayer boom must match the width of the disc to avoid overlap. Two tractor operators are required. After spraying ,the crop still has to be seeded, if the weather holds.

In conclusion, Treflan applied PPI provided excellent weed control with no crop injury. However, many things must work favorably to get the job done.

REFERENCES: Doohan, D. J. 1981. Weed Control In Seedling Alfalfa. Adaptive Research Report. p. 232-236. Plant Industry Branch, New Brunswick Department of Agriculture and Rural Development.

ACKNOWLEDGEMENTS: The assistance of Lutescroft Farm is appreciated.

CLIMATIC MONITORING AT CROP DEMONSTRATION TRIALS

BY

G. S. READ

Abstract: Weather conditions during the 1982 growing season were monitored at several crop demonstration trials in various locations in New Brunswick.

INTRODUCTION: Crop production is strongly influenced by the nature of the weather during the growing season, as a result, any interpretation of the results obtained in field trials, either between years, locations or cultivars, must have reliable weather data available.

RESULTS: In 1982, there were 22 climate stations operating under the climate unit supervision. This year, the principal areas of concentration were potatoes, blueberries, tobacco, soybeans and corn.

Maximum and minimum temperatures were recorded on thermographs housed in Stevenson screens, and checked by thermometers.

The following list identifies the station, its location, the co-operator looking after the stations and the commodity involved.

Station	County	Co-operator	Commodity
Sussex	Kings	G. Read	Corn
Florenceville	Carleton	R. Parry	Soybean, Grain, Potatoes
Bernard	Kent	J. Wade	Tobacco
Cap Pele	Westmorland	J. Wade	Tobacco
Tower Hill	Charlotte	G. Wood	Blueberry
New Denmark	Victoria	S. Pray	Potato
Grand Falls	Victoria	E. Cote	Potato
Arthurette	Victoria	B. DeMerchant	Potato
Aroostook	Victoria	D. McLaughlin	Potato
Woodstock	Carleton	H. Keenan	Potato
Neguac	Gloucester	G. Chiasson	Blueberry
Brantville	Gloucester	G. Chiasson	Blueberry
Daley	Gloucester	R. Theriault	Soybean

Station	County	Co-operator	Commodity
St. Sauveur	Gloucester	G. Chiasson	Blueberry
Tilley Road	Gloucester	G. Chiasson	Blueberry
Everett	York	G. Read	Apples
Finnigan	Kent	P. Finnigan	
Cails	Kent	L. Cail	Beans
Coburn	York	J. Coburn	Apples
Sheila	Gloucester	G. Losier	Blueberry
King	Kent	P. Finnigan	
Maillet	Kent	P. Finnigan	Beans

CONCLUSIONS: Weather data were collected at 22 climate locations for the 1982 growing season, primarily for use in analysis of crop performance, for evaluating disease conditions, and for use in predictive techniques for crop and insect development.

POTATO LATE BLIGHT SPRAY FORECAST

BY

G.S. READ

Abstract: A late blight potato spray forecast was provided for the potato industry in 1982 via two information sources. One, a detailed forecast with spray interval recommendations on two code-a-phone systems, and a second general forecast issued through Environment Canada's Weatheradio, a continuous broadcast of weather information on VHF channels.

INTRODUCTION: A temperature and relative humidity monitoring network was set up at nine (9) locations throughout the potato belt. This information was sent to Agriculture Canada and a detailed blight forecast was prepared courtesy of W.A. Hodgson, Agriculture Canada. An advisory message was issued by A. Perley Plant Pathology Staff of the Potato Division, New Brunswick Department of Agriculture, and recorded on a code-a-phone system located in Wicklow, N.B. The potato blight index was issued to Environment Canada's Weatheradio through the cooperation of the Fredericton Weather Office.

The information was issued daily from July 5 through September 5.

RESULTS: The code-a-phone system at Wicklow received approximately 600 calls. The Late Blight Forecast was also available on the Fredericton Farm Forecast Code-A-Phone operated by the Fredericton Weather Office.

The numbers of growers receiving the forecast and subsequent application of the recommendations are difficult to measure. A follow-up questionnaire may be necessary to evaluate and improve the content and communication methods used.

CONCLUSIONS: A field trial implementing the spray schedule recommended by the forecast should be set up to evaluate the dollar savings possible with fewer and more timely sprays. These economic benefits of reduced chemical applications would be particularly significant in a dry year. The 1982 growing season was a dryer than normal year in most locations.

ACKNOWLEDGEMENT: A thank you is in order for the summer student crews who maintained the climate stations necessary to implement this program.

SOIL SURVEY AS A BASIS FOR LAND MANAGEMENT

JOHN K. MACMILLAN, JEAN LOUIS DAIGLE

Abstract: Detailed soil surveys were conducted on 12 farms and the information collected is being used to develop and assess land management plans for each farm. Progress to date on one farm is presented below.

INTRODUCTION: Agricultural production requires a very high level of management in order to succeed and remain competitive. Comprehensive land management would require a detailed on farm soil survey which will serve as a basis for developing farm plans including soil conservation systems where required. The objective of this work is to develop an operational system in which soil survey information is incorporated in developing such plans. This has been done in Maine where local conservation districts have been established and are assisted by the Soil Conservation Service of the United States Department of Agriculture. Soil physical data is used extensively in Quebec before drainage plans are prepared.

METHODS: A detailed soil survey was done on the farm. Transects were made as dictated by topographic and soil conditions. At each examination site a soil description was taken as were samples at 20 cm intervals to 100 cm where possible. In addition to the descriptions general notes were taken about soil conditions, cropping practices and other pertinent information. The examination sites were recorded on an aerial photo mosiac. Following the field survey a soil map (Fig. 1) was prepared using aerial photo interpretation and field notes. Using this soil map plus the lab data and field notes, interpretative maps were prepared showing the existing situation, ie topography and slope direction, present field layout and cultivation direction (Figure 2), rooting depth, drainage class, erodibility and available water storage.

The next step was the preparation of maps showing the proposed measures for improving the land management. Figure 3 shows the proposed drainage design while Figure 4 shows the proposed erosion control and realignment of fields in this case for a potato farming system.

DISCUSSION: On this particular farm it was evident that the soil was being moved down hill and deposition was evident on the lower slopes. A cross sectional diagram of one section of the farm was prepared (Figure 5) showing the different slope segments. The estimated soil loss under different rotations was calculated (Table 1). These are much higher than the tolerable levels of 9 tonnes/Ha desired.

The bottom portions of the fields showed drainage problems that would cause problems throughout the growing season depending on the rainfall. Within these areas potatoes that can't be harvested is quite common even though cultivation has been up and down slope. Soils shallow to the compact layer are common in many areas. This was caused by erosion removing the topsoil. Such soils tend to vary from excessive moisture to droughty conditions, again depending on rainfall.

The plans for drainage and erosion control are preliminary (Figures 3 & 4) and separate but, will be intergrated and modified in the final plan. In this regard, we have not taken into account what affect deep tillage would have if done between the terraces. If some of the water moving horizontally could be moved vertically it could result in wider spacings of both tile lines and terraces.

In doing the surveys and plans for the farms in 1981 a number of questions came up:

a) Would the producers accept such a program?

b) Can the plans be produced at an economical cost?

c) What intensity of surveying and sampling is necessary to provide the information required?

d) What analysis is necessary?

e) Is there faster, yet accurate, laboratory methods available?

f) Should both cleared and wooded land be surveyed?

g) Should the survey and lab procedures differ for different farming systems?

In 1982, by means of an ASA II Implementation Project, the work has expanded to answer the questions on cost and on more farms using different farming systems considering that we are developing a service package not a research program.

ACKNOWLEDGEMENTS: The cooperation of J.G. Pelletier, potato producer from St. Andre, is greatly appreciated.

REFERENCES: What Is a Farm Conservation Plan?, U.S.D.A., Soil Conservation Service P.A.-629.

DETAILED SOIL SURVEY

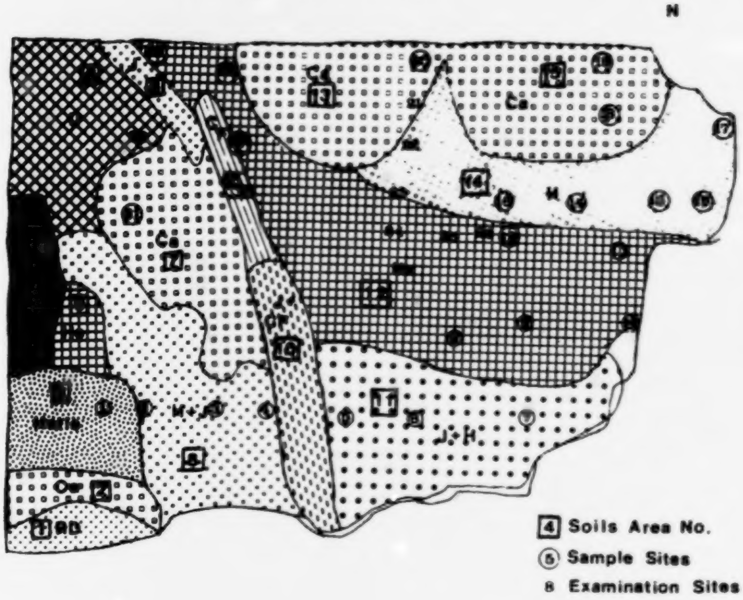

N
Ca
13
Ca
14
M
17
Ca
M+J
J+H
11
Ow
RB
PF
4 Soils Area No.
5 Sample Sites
8 Examination Sites

Fig. 1

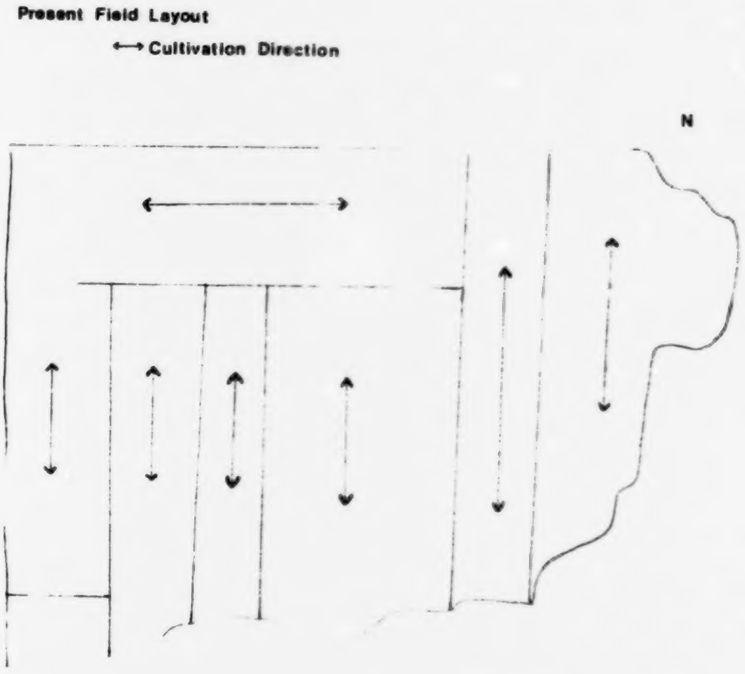

Present Field Layout
⟷ Cultivation Direction
N

Fig. 2

Tile Drainage Preliminary Plan Without Erosion Control

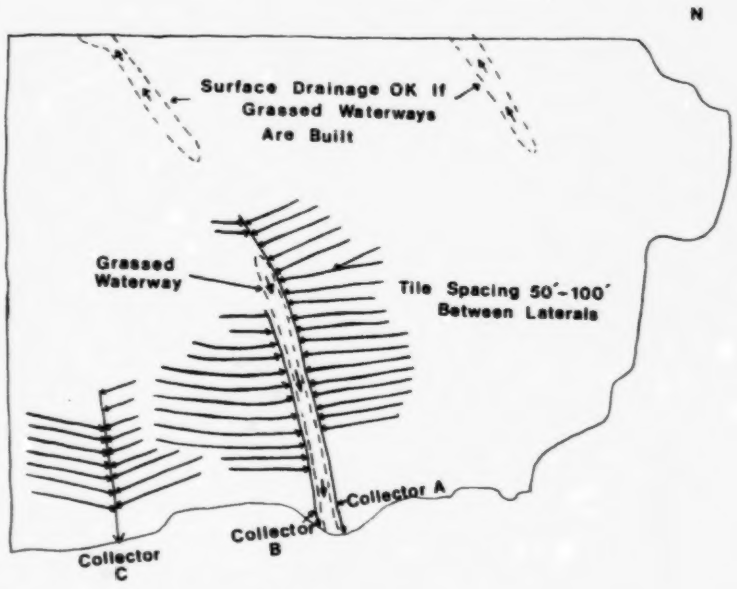

N
Surface Drainage OK If
Grassed Waterways
Are Built
Grassed
Waterway
Tile Spacing 50'-100'
Between Laterals
Collector A
Collector
B
Collector
C

Fig. 3

PRELIMINARY EROSION CONTROL DESIGN

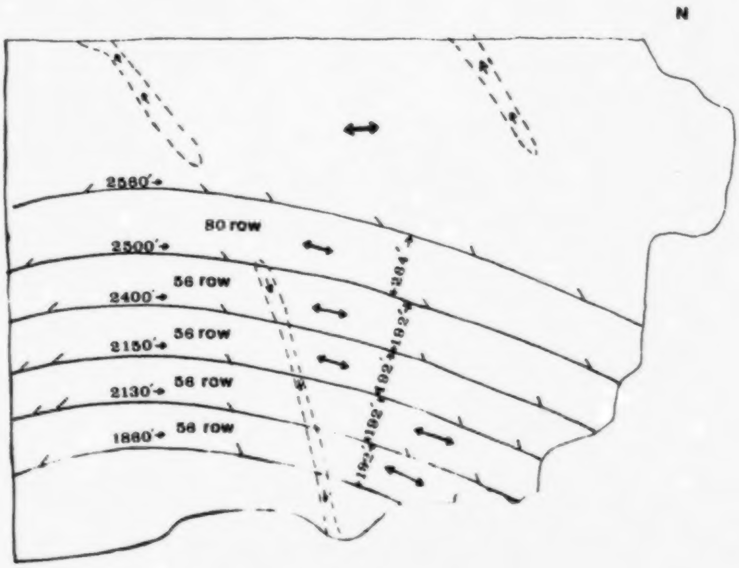

N
2560'
80 row
2500'
56 row
2400'
56 row
2150'
56 row
2130'
56 row
1860'
56 row
264'
192'
192'
192'
192'

Fig. 4

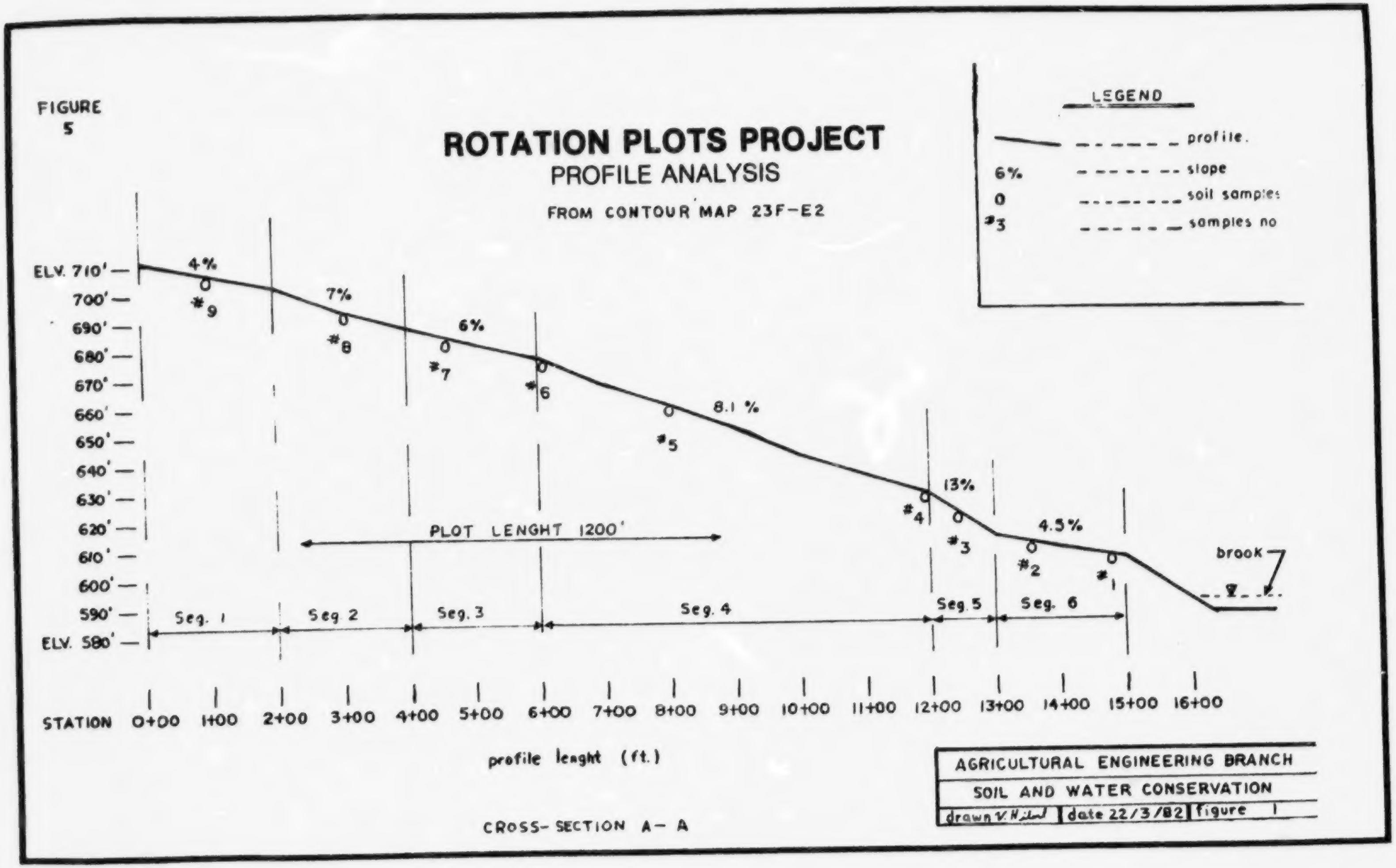


FIGURE 5

ROTATION PLOTS PROJECT

PROFILE ANALYSIS

FROM CONTOUR MAP 23F-E2

CROSS-SECTION A- A

AVERAGE ANNUAL SOIL LOSS (tons/acre/year)

for the Rotation Plots Project (St-Andre)

by: Jean-Louis Daigle, Dec. 15, 1981

SLOPE SEGMENTS * (Station)	Slope %	LS Factor	VARIOUS CROP ROATION (up & down hill cultivation) C VALUES							
			P.P.... C = .56	PGrPeas C = .38	PPGr C = .38	PGr C = .31	PPGrH C = .24	PPGrHH C = .18	Gr.Gr... C = 0.12	H.H..... C = .04
1 (0 - 200)	4	0.53	6.46	4.38	4.38	3.57	2.77	2.07	1.38	0.46
2 (200' - 400')	7	1.35	16.44	11.16	11.16	9.1	7.05	5.29	3.52	1.17
3 (400' - 600')	6	1.65	20.10	13.64	13.64	11.13	8.61	6.46	4.31	1.44
4 (600' - 1200')	8.1	2.79	33.98	23.06	23.06	18.81	14.56	10.91	7.28	2.43
5 (1200' - 1330')	13	4.18	50.91	34.55	34.55	28.18	21.82	16.36	10.91	3.64

NOTES:
1. - Universal soil loss equation values used: R = 75, K = .29, P = 1
2. - The soil erodibility values were derived from John MacMillan Soil Survey preliminary.
3. - The C value computation is for fall plowing except for potatoes that are spring plowed and no residues are left except cover crops.
4. - P.P... = potatoes grown continuously; PGrH = potato grain hay rotation

Table 1

DEMONSTRATION OF A RIPPER BEDDER

BY

K. J. MACISAAC

Abstract: A machine which subsoiled and formed raised beds in one operation was demonstrated at three locations. Yields in corn and squash crops were increased compared to yields obtained by conventional tillage. Problems were encountered with field operation of the machine.

INTRODUCTION: Heavy soils in Southeastern New Brunswick, often contain a "hardpan". MacMillan (1981) found that these pans restrict vertical water movement and limit root development of crops. He also ascertained that deep tillage created deeper rooting zones, better aeration and improved water holding capacity.

Recent tillage research in Iowa and Ontario has increased yields in field corn using a technique called ridge seeding. By making small raised beds in the fall of the previous season, drainage is improved allowing corn to be seeded into those rows earlier than normal. The raised beds warm up faster in the spring improving germination and seedling vigor.

There could be an advantage to combining both these new techniques in an operation. Subsoiling directly under the row would break any existing hardpan allowing water movement and root penetration downward. Creating a raised bed would provide both surface drainage and soil warmth. As the upper root system developed in the loose topsoil; the lower root system could reach into the subsoil for moisture and nutrients during mid-summer.

MATERIALS AND METHODS: A three point hitch, Cole, 1 shank subsoiler with a Hiller kit attachment was obtained on loan for demonstration purposes from

Maritime Farm Supply Ltd. The machine was demonstrated at three locations: (1) Four rows were formed at Allan Saunders' in Petitcodiac on May 19. The corn variety Px403 was planted into these rows. (2) A twenty yard area was similarly tilled at Joerg Von Waldow's farm in Anagance on May 19. A ten yard area was ripped on plowed ground before discing. Another ten yards were disced before ripping. The corn variety Pride 1108 was seeded on May 22. (3) Four rows were formed at Ken Reicker's farm on the New Line Road on June 1. Squash was planted ten days later.

RESULTS AND DISCUSSION: At each corn location, it was difficult to make consecutive rows thirty inches apart without driving the tractor wheel on the previous row. The distance between the wheel tread and centre of the drawbar was awkward on this one row model. At the Petitcodiac location, for example, only one row of the four was not compacted by the tractor tire.

A wet subsoil existed at the Petitcodiac location, resulting in clods being brought to the surface. Each row had to be made exactly thirty inches apart to accommodate the four row corn planter. Considerable horsepower was required for the ripper bedder, and a Ford 5000 tractor was used. Overall results were not dramatic as the field was systematically tiled and the season was extremely dry.

The machine performed best at the New Line Road site because of the crop planted. Squash were planted in double rows forty-two inches apart, with a distance of four feet before the next two rows began. This made it easier to use the machine. The soil was sandy on the surface with a heavy clay texture underneath, as indicated by the wet clods brought up. The ripper penetrated from the top of the row to a depth of twenty inches into the subsoil. Infertile subsoil brought to the surface, caused the crop to get off to a slow start but topdressing improved this problem. The raised rows yielded approximately 1.5 tons/acre while the conventional rows yielded approximately 1.25 tons/acre. Squash were also harvested three days earlier on the raised beds. Maturity would have to be at least one week earlier to obtain a higher price per pound on the early market, but this is certainly not an impossible goal.

At the Anagance location, similar problems occurred with row spacing of corn, and it was impossible to avoid compacting the previous row. Where the ripper bedder was used directly on spring plowing, it left a rough surface with hard clods creating a poor seedbed. The machine seemed to require less horsepower at this site, as only a Ford 4000 tractor was used. This might be explained, however, by a drier soil. The previous crop was also corn so there was an additional problem with corn stalks catching on the shank and wear skirt. The corn was harvested as silage on October 19 and the results are presented in Table 1.

TABLE 1: PRIDE 1108 CORN SILAGE

Treatment	Yield (tons D.M./acre)	%D.M.	Population (plants/acre)	%Protein
Ripper Bedder	3.21	34	23,000	6.9
Conventional	2.62	31	18,750	6.4

CONCLUSION: The basic principle of the ripper bedder works well. Getting the machine to work on a field scale is a problem. Working with thirty inch corn rows, one answer might be to add an additional unit to the one row model. This would resolve the problem of having to centre the machine but the horsepower requirement would be doubled.

ACKNOWLEDGEMENT: Appreciation is extended to Richard Melanson and Brian Beaton at Maritime Farm Supply Ltd. in Moncton who acquired and loaned this machine for demonstration.

REFERENCES: MacMillan, J.K., 1981. Improvement of Soil Physical Properties by the Breakup of Tillable Pans. Adaptive Research Report, p. 260-264, Plant Industry Branch, New Brunswick Department of Agriculture and Rural Development.

Agribook Magazine, 1982. Corn in Canada

A COLORIMETRIC METHOD FOR DETERMINATION OF ORGANIC MATTER IN SOILS

By

ADELE GALLAGHER

Abstract: A method for colorimetrically determining organic matter in soils was tested in regard to its speed and accuracy in comparison with the routinely utilized titrimetric method of organic matter estimation. The colorimetric method proved reliable and has been included in the laboratory procedures.

INTRODUCTION: Organic matter is generally determined to indicate general level of soil fertility and also used in calculating soil erodibility.

Approximate organic matter content in soils can be determined through several different procedures involving wet or dry combustion methods. In the Soils Laboratory the Walkley-Black Method of wet combustion (Allison, 1965) was followed and involved oxidization of the soil organic matter. This method was subject at times to human error and could be somewhat time consuming. A more rapid method to quantitatively determine organic matter through colorimetric analysis was selected and tested (Sims & Haby, 1971).

OBJECTIVE: Comparison of the Walkley-Black Method with the colorimetric procedure proposed by Sims & Haby (1971) was undertaken to determine whether the latter was a faster and accurate method of estimating per cent organic matter in soils.

MATERIALS AND METHODS: Fourteen soil samples collected from depths of 0 to 80 cm were selected for analysis using both methods; the Walkley-Black titrimetric and the Sims & Haby colorimetric.

Procedure for the Walkley-Black method entailed placing 1 g soil samples in 250 ml erlenmeyer flasks, adding 10 ml of 1 N.$K_2Cr_2O_7$ (potassium dichromate) and 20 ml of concentrated sulfuric acid to aid in the oxidation process. The mixture was swirled and left to stand for 30 minutes after which 200 ml of distilled water was added. The flasks were placed on a magnetic stirrer and 3 or 4 drops of o-phenanthroline-ferrous complex (indicator) were added and the excess dichromate titrated with $FeSO_4$ (Ferrous Sulfate). The volume of $FeSo_4$ was multiplied by a "Van Bemmelin factor" of 1.72 based on the assumption that soil organic matter contains 58% carbon (Allison, 1965).

The principle behind the colorimetric method of organic matter analysis is to colorimetrically determine the amount of unreacted dichromate after the oxidation reaction on the soil sample is completed (Sims & Haby, 1971). A standard curve was prepared using sucrose samples from 0 to 7 per cent in organic matter. Sucrose was used as a standard since it is a known organic compound. The color reaction obtained adheres to "Beer's Law", ie. the optical density of a solution is directly proportional to the concentration of the color component of the solution. It is from this that a linear relationship between the absorbance and original sucrose concentrations was established (Figure 1). Procedure for analysis of the sucrose standards involved placing the samples in 125 ml erlenmeyer flasks, adding 10 ml of $K_2Cr_2O_7$ and 20 ml of sulfuric acid. The samples were swirled and left for 20 minutes after which the contents were brought up to 100 ml with distilled water. The solutions were filtered through glass fiber filter paper and read on a Bausch & Lomb Spectronic 88 spectrophotometer at a wavelength of 600 mu. Results of the 7 sucrose readings are shown as the standard curve in Figure I.

The colorimetric procedure used to establish the standard curve was applied to the fourteen soil samples which were also analyzed by the Walkley-Black Method, and absorbance readings were obtained (Figure II).

RESULTS AND DISCUSSION: Table 1 shows the comparison of the figures from the colorimetric method and the Walkley-Black titrimetric method. A linear relationship between the results of both methods using a Least Squares Curve Fit was established (Figure II). The following formula was devised from the curve fit of the data:

$$\% \text{ O.M.} = \frac{\text{Absorbance Reading} - \text{Intercept of the Curve } (.024)}{\text{Slope of the Curve } (.143)}$$

Standard error of the prediction was also calculated using the following formula, taking the data in

Table I into consideration:

$$SEP = \sqrt{\frac{\sum(d_i - \bar{d})^2}{n-i}}$$

where: $d_i = LAB - IA$

$$\bar{d} = \frac{\sum d_i}{n}$$

n = number samples

Standard error of prediction = .007

The colorimetric formula is being used in the laboratory for analysis of organic matter in soil samples and results have correlated well with organic matter content figures expected from the regions the samples were obtained. The colorimetric procedure reduces the time it usually took to titrate by approximately two hours. By comparison the colorimetric method is not only more rapid than the Walkley-Black Method, it is less tedious and gives less cause for human error.

TABLE I - Comparison of the Results from the Colorimetric Method and Walkley-Black Method.

Sample #	Colorimetric Determination		Titrimetric Method
	Absorbance	% Organic Matter	% Organic Matter
1	.50	3.32	3.30
2	.39	2.55	2.52
3	.19	1.16	1.07
4	.09	.46	.44
5	.47	3.11	2.78
6	.20	1.23	1.17
7	.16	.95	1.01
8	.14	.81	.70
9	.47	3.11	3.30
10	.19	1.16	1.22
11	.05	.18	.29
12	.05	.18	.13
13	.43	2.83	2.99
14	.13	.74	.91

FIGURE I

SUCROSE STANDARD CURVE - OXIDATION OF SUCROSE SAMPLES EQUIVALENT TO O TO 7 PER CENT ORGANIC MATTER

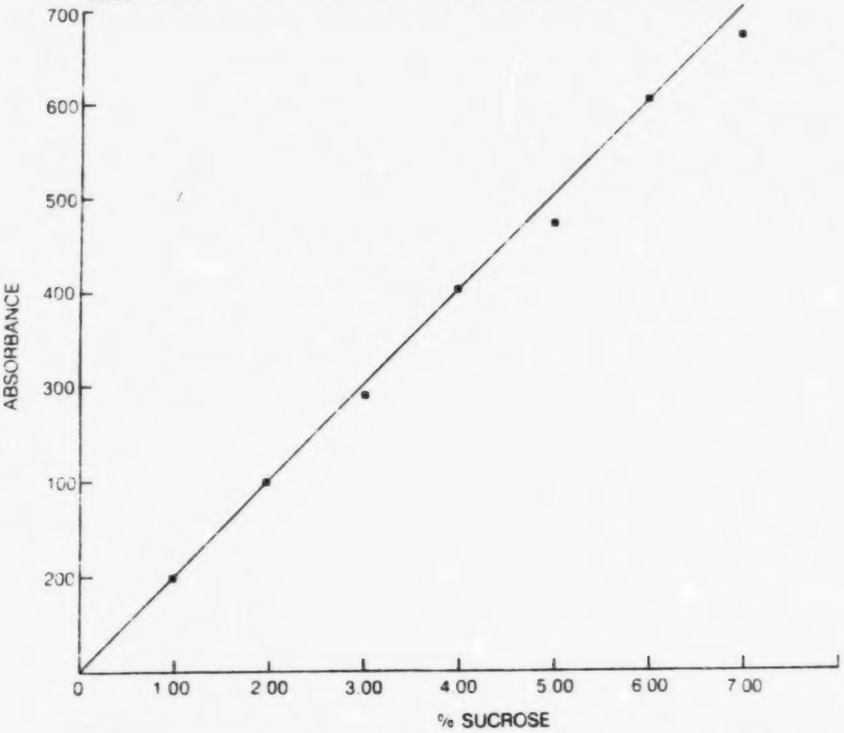
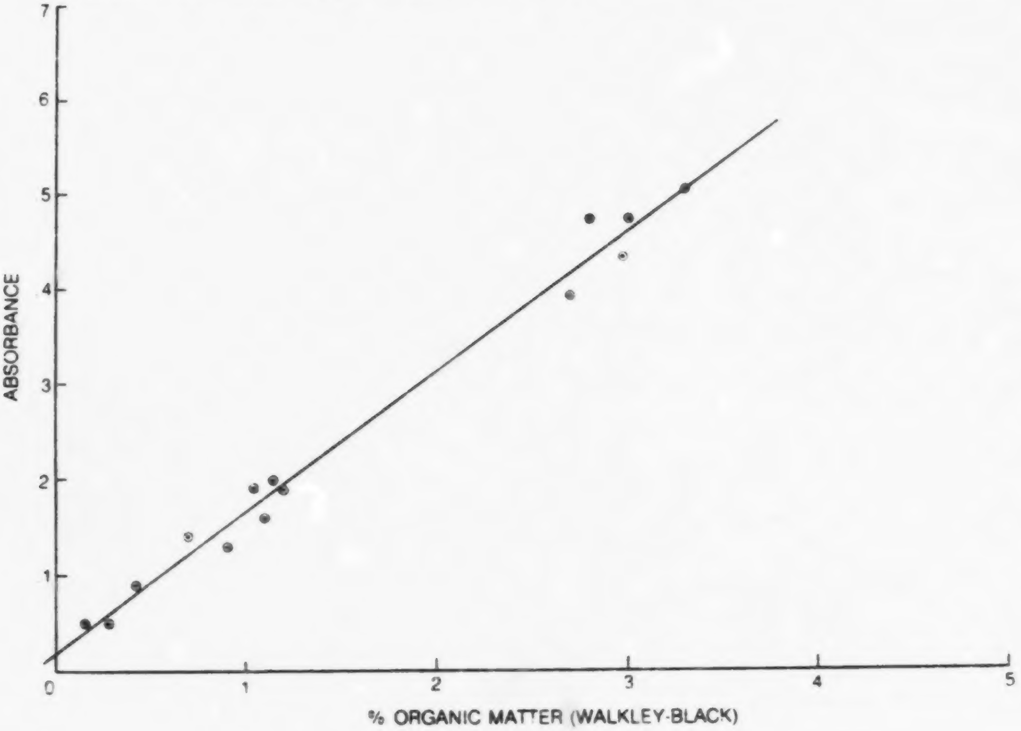


FIGURE II

LINEAR REGRESSION SHOWING RELATIONSHIP BETWEEN RESULTS OF THE TITRIMETRIC AND COLORIMETRIC METHODS



REFERENCES: Allison, L.E., 1965. Organic Carbon. In Agronomy No. 9. Methods of Soil Analysis, Part 2. Black, C.A., ed. p. 1367-1378.

Sims, J.R., and V.A. Haby, 1971. Simplified Colorimetric Determination of Soil Organic Matter. Soil Science. Vol. 112, No. 2, p. 137-141.

ACKNOWLEDGEMENTS: The helpful assistance of Garnet Demerchant, Soils Technician, Agriculture Canada, Fredericton Research Station, and Alan Scott, Soils Lab. Technician, N.B. Agriculture is gratefully acknowledged.

EVALUATION OF SUBSOIL SLIT DRAINAGE

BY

BOYD PETERS AND J. K. MACMILLAN

Abstract: On-farm installation of subsoil slit drainage was carried out at two locations in Southeastern New Brunswick to evaluate the improvement of soils with limited drainage. Monitoring of the two locations in Cornhill and Shemogue will be carried out in the spring of 1983.

INTRODUCTION: Certain New Brunswick soils cannot be drained solely by tile. Water is unable to move vertically to the tile as a result of compact or impermeable horizons within the profile. In New Brunswick, approximately 2.5 million hectares have drainage impeded by hardpans or impermeable horizons. (Saini, 1977).

Subsoiling loosens the soil to a depth of 40 or more centimeters using rigid steel shanks which do not invert the soil. It has been widely used in Europe and North America to break up hardpans. However, the period of benefit obtained from a single subsoiling operation may be limited from one to three years. (Cassel, 1979, Chow, 1982).

The duration of soil improvement depends on subsoil density, moisture content, soil texture, depth of subsoiling and especially the amount and pattern of machinery traffic over the field after subsoiling. A method of fracturing these pans is required which will extend the duration of benefit.

One method of achieving a long-term improvement is to make deep slits and maintain them with a permeable foreign material, in this case Styromull. This is known as Styromull slit drainage.

In this type of drainage, a lateral channel filled with Styromull for the purpose of drainage will carry water if the slope is adequate. The resistance to flow is greater than tile, but as the area of contact is greater, water enters the channel more easily. The cross section of the channel may be circular, but there are several advantages to a rectangular cross section. The contact area of a rectangular cross section is greater than a circular cross section of equal area.

The channel can extend vertically through any impermeable layer and local deviations from the required average slope are tolerable.

Styromull slit drainage allows increased vertical movement of water, channels water laterally over short distances, allows water to move down through heavy topsoil, helps prevent excessive surface runoff on slopes and improves aeration and drainage required in certain agricultural soils. It can be used in conjunction with branch and interceptor drains and outfall ditches to complete the drainage system.

The objectives of this project are to:

1) Demonstrate and evaluate the effectiveness of the slit drainage subsoiler for the improvement of drainage in special problem soils.

2) Determine optimum spacing and time of installation.

3) Estimate the cost of installation of subsoil slit drainage.

MATERIALS AND METHODS: No machinery currently available in New Brunswick is designed specifically for the purpose of deriving extended benefits from subsoiling. A subsoiler was purchased and modified by the addition of cheek plates constructed of 1/2" wear plate steel. A hopper was built from 3/16" plate steel. The hopper was designed with steep sides (55°) so the material would flow easily, and was mounted directly over the cheek plates. A damper was installed to regulate flow. 50-55 cm was determined to be the maximum depth this device could be used in areas with existing tile drainage, often within 60 cm of the surface. Width was limited to open a 10 cm slit, thus reducing power requirement.

Styromull consists of chips of polystyrene, 4-12 mm in diameter, with a loosely packed density of 12-20 kg/m^3. There is no exchange of material between Styromull and soil or plants. Styromull is compressible, but will partly recover if compressed only slightly. Severe compression will permanently distort and adversely affect the ability of Styromull to transmit water. Compressed to 50% of its original volume, it has a hydraulic conductivity of 3.3×10^{-4} cm/sec. Compressed to 50% of its volume, the hydraulic conductivity of styromull is reduced to 1.7×10^{-4} cm/sec.

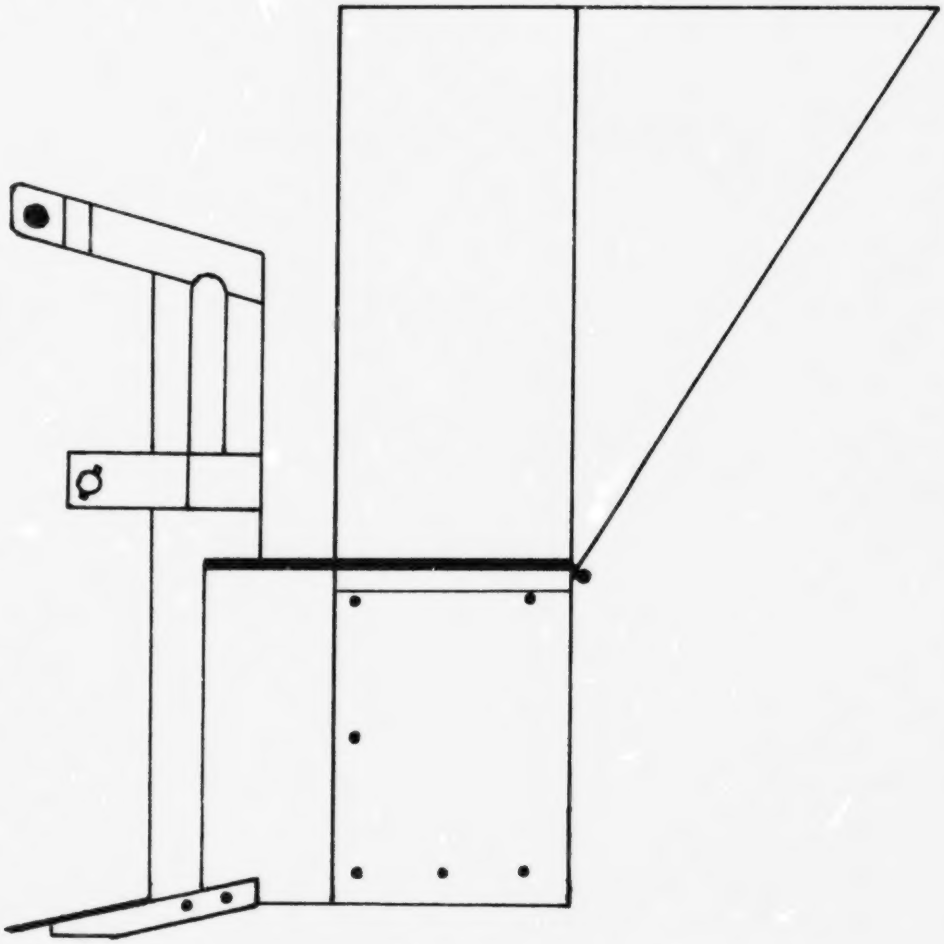


FIGURE 1 SLIT DRAINAGE SUBSOILER
SIDE VIEW SCALE 1:11

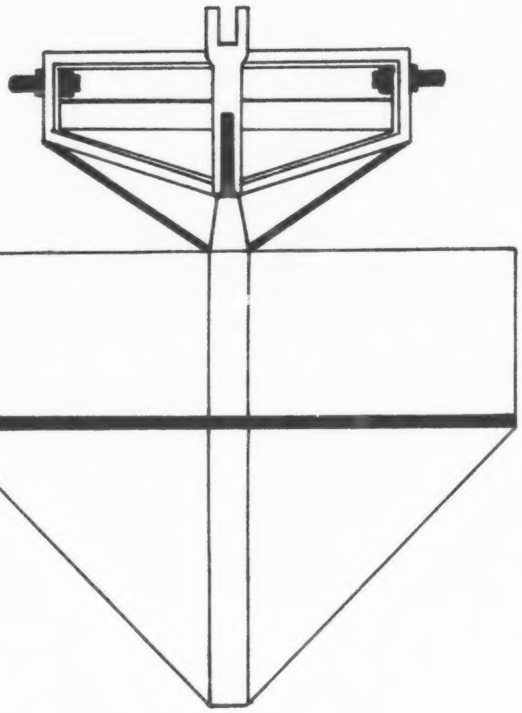


FIGURE 2 TOP VIEW SCALE 1:15

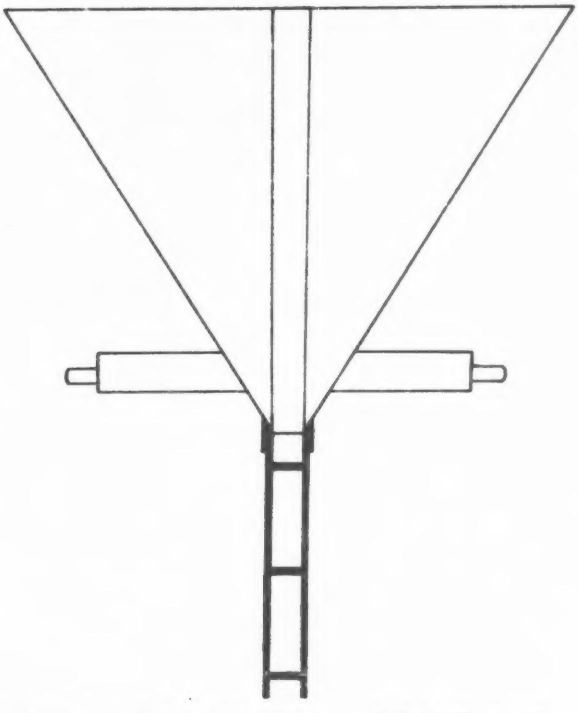


FIGURE 3 BACK VIEW SCALE 1:15

Two sites were chosen to demonstrate slit drainage. In Cornhill, the site had a compact basal till and limited surface permeability. The Shemogue site had a fragipan, characteristic of the area, with good permeability above and below it. It had been tiled but the improvement of drainage in a number of areas was limited. The slit drainage subsoiler was used perpendicular to the existing tile lines.

Drainage lines were installed in a system of laterals and collectors similar to tile drainage. Lateral spacing ranged from 3 to 30 meters. An outlet consisting of 4" plastic pipe with mesh over one end was installed to prevent the Styromull from being washed out into the surface drainage channel.

RESULTS AND SUMMARY: The slit drainage subsoiler was constructed at a cost of $1,500.00. It was found that installation of Styromull occurred between 20 and 55 cm. Thus, plowing of sites with installed slit drainage would not disturb the established lateral channels.

One thousand meters of slit drainage was installed with a material cost of $0.65/m. Cost estimates per hectare will depend on lateral spacing, but it would appear that use of Styromull will be expensive. Gravel could prove to be a less expensive alternative but handling problems will be greater.

Suitable tractor power was not a limiting factor. 43-85 h.p. two-wheel drive tractors and a 105 h.p. four-wheel drive tractor were used. Traction was a problem on wet soils. This could be overcome by use of dual wheels or downslope installation.

Best results were obtained when the soil was dry at installation. At the Shemogue site, the soil was near field capacity and compaction of the column occurred. This will limit its ability to transmit water.

No definite conclusions were made as monitoring will begin in the spring of 1983. Tipping bucket apparatus will be used to measure outflow from the sites. Further sites will be tested in the summer of 1983.

ACKNOWLEDGEMENTS: The authors acknowledge H. Von Kintzel for suggesting this idea and J. Von Waldow and Thilium Farms for supplying machinery, time and land for testing this concept.

Special acknowledgement goes to John Monteith for his work on design, construction and testing of the slit drainage subsoiler.

REFERENCES: Cassel, D. K. 1978. Subsoiling. Crops and Soils Magazine. 32(1): 7-10.

Chow, Lien. 1982. Personal communication.

Robertson, L. S., Erickson, A. E. Soil Compaction: Symptoms, Causes, Remedies. Crops and Soils Magazine. 30(5): 7-9.

Saini, G. 1977. Breaking Up the Hardpan. Maritime Farmer. Nov. 15, 1977.

Styromull for Drainage and Soil Improvement. Technical Information Bulletin. Badishe Anilin - & Soda - Fabrik Ag. (BASF). 6700 Ludwigshafen, Federal Republic of Germany. May, 1972.

Styromull Soil Conditioner. Technical Information Bulletin. BASF Canada Ltd., 5850 Cote de Liesse Road, Town of Mount Royal, Montreal 9, Quebec.

COMPARISON OF CROP ROTATIONS IN THE POTATO PRODUCTION SYSTEM*

BY

J. DAMBOISE, I. GHANEM, J. MACMILLAN, J.L. DAIGLE

Abstract: A field evaluation of five crop rotations was established in 1980. Monitoring of the effect of these rotations on soil properties, potato yield and quality will continue until 1983.

INTRODUCTION: Potato growers have followed a monoculture intensive production system. This practice has resulted in deterioration in soil quality i.e. increased soil compaction and erosion. Decrease in yield and quality of the potato crop has been attributed to mono-culture. The objective of this field trial is to compare and demonstrate various crop rotation systems.

MATERIALS AND METHOD: A field in continuous potatoes for more than 10 years was selected for the purpose of this trial. The field was divided into five sections of approximately .7 hectare each. The planned rotations are outlined in Table 1. The crop in each section was seeded according to conventional and recommended procedures.

RESULTS AND DISCUSSION: The yield data and visual observation on soil erosion are recorded in Table II, III and IV for 1980, 1981 and 1982 respectively. The 1982 potato yield was slightly lower in section 4, after following a buckwheat crop, than section 5 (continuous potato), but the quality of the crop was considerably improved (Table V). The yield reduction could be due to nitrogen level and/or weed competition. The same fertility (10-10-10, 1700 kg/ha) was applied to both crops. The nitrogen level should have been increased to the potato crop following buckwheat in order to break down the buckwheat crop residue. The volunteer buckwheat and other weeds growing in section 4 could have attributed to the potato yield reduction.

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*Partially funded by Technology Transfer Program, A.S.A. II

CONCLUSION: This trial will be continued until 1983 before any conclusion can be made. Potato quality improvement has already been noted in the buckwheat rotation program.

TABLE I. Planned Rotation, 1980-1983

Section	1980	1981	1982	1983
1	potato	grain-clover	clover	potato
2	potato	grain	grain	potato
3	potato	peas	winter grain	potato
4	potato	buckwheat	potato	potato
5	potato	potato	potato	potato

TABLE II. 1980 Crop Yield

Section (Treatment)	Yield* Kg/ha	Soil Erosion Visual Conservation (Scale 1-10)
1. Potato (Russet Burbank)	25,400	N/A
2. Potato (Russet Burbank)	25,400	N/A
3. Potato (Russet Burbank)	25,400	N/A
4. Potato (Russet Burbank)	25,400	N/A
5. Potato (Russet Burbank)	25,400	N/A

* average yield of all sections

TABLE III. 1981 Crop Yield and Visual Observation of Soil Erosion

Section (Treatment)	Yield kg/ha	Soil Erosion Visual Observation (Scale 1-10)
1. Grain (Opal W.)	2230	2
2. Grain (Opal W.)	3640	3
3. Peas (Processing)	1900	7
4. Buckwheat (Tartary)	730	5
5. Potato (Russet Burbank)	26,500	8

TABLE IV: 1982 Crop Yield and Visual Observation of Soil Erosion

Section (Treatment)	Yield kg/ha	Soil Erosion Visual Observation (Scale 1-10)
1. Red Clover*	3000	1
2. Spring Cereal (oats)	2500	3
3. Winter Cereal (Lennox)	2100	3
4. Potato (Russet Burbank)	30600	5
5. Potato (Russet Burbank)	32500	7

*First cut as dry hay, regrowth was plowed under as green manure

TABLE V: Effect of a buckwheat rotation program on Russet Burbank yield and quality

	Rotation Program	
Parameter	P.P.P.[1]	P.Bu.P.[2]
Total yield 1982 (kg/ha)	32,500	30,500
Canada No. 1 kg/ha	15,700 (49%)	17,800 (58%)
Canada No. 2 kg/ha	5,600 (17%)	6,400 (21%)
Rejects kg/ha	11,100 (34%)	6,400 (21%)
Specific Gravity	1.080	1.083

1: P. Potato; Bu - Buckwheat

PROGRESS REPORT ON THE DETERMINATION OF PROTEIN IN LIVESTOCK FEED BY NEAR INFRARED REFLECTANCE SPECTROPHOTOMETRY

BY

ALAN SCOTT

Abstract: This report covers the progress in the application of near infrared reflectance (NIR) instrumentation to livestock feed analysis in the New Brunswick Provincial Agricultural Laboratory. The period of this report is from January to November of 1982. Calibration constants were developed on the Technicon InfraAlyzer 400 for protein analysis of grass, hay, wheat, barley and oats. The instrument is now capable of routine analysis of these products with accuracy comparable to the manual protein analysis. A set of calibration constants were also developed for acid-detergent fiber (ADF) in grass hay. In the future, the accuracy of these calibrations will have to be monitored and revised if necessary.*

INTRODUCTION: Near infrared (NIR) reflectance spectrophotometry is based on measurement of the light absorption by components of food products. These absorption bands are characterized by broad, overlapping peaks in the absorbance spectrum of the product. For an optically thick sample, such as finely ground grain, a reflectance type measurement is necessary. The log of the inverse of the diffuse reflectance at a wavelength absorbed by a constituent can be related to the concentration of the constituent by a simple linear equation. However, this simple relationship is only valid if no spectral interferences occur. The problem of overlap of the absorption bands of multiple components can be resolved by the use of several, carefully selected, wavelengths and multiple linear regression analysis. This need for extensive data manipulation is one of the major reasons that this region of the spectrum (1500 to 2500 nm) has largely been ignored for qualitative analysis in the past. The advent of microprocessors and modern electrical and optical systems has made this type of analysis practical for use on a routine basis.

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*Registered Trademark, Technicon Industrial Systems, Tarreytown, N. Y.

The advantages of this method of analysis are inherent in the simple optical measurements used, and in the computerized nature of the instruments. The major requirement for sample preparation is grinding to a fine powder. Hazardous chemicals and high temperature digestions are not required. In a routine analysis situation, a short operator training period is sufficient, provided that a more skilled operator is available for consultation. Maintenance requirements are minimized by rugged design and the use of sealed optical components. The short analysis cycle and minimal sample preparation allow the analysis of large numbers of samples at a low cost per sample.

The method of protein analysis currently being used in this lab requires a digestion with hot, concentrated sulfuric acid followed by dilution and colourimetric analysis (4). This method requires a painstaking process of sample weighing ,acid measurement, thermal digestion, dilution, and analysis on a continuous-flow colourimeter. Every step in this procedure is critical and a lengthy period of training is required for reliable results. The method is labour intensive, both in the analysis and in the subsequent glassware clean-up. In addition, this method produces environmental hazards, mostly in the form of acid fumes and acid contaminated waste water.

The major difficulty to be overcome in applying NIR reflectance to the analysis of a specific product is the task of properly calibrating the instrument (1, 2, 3, 5, 6). The collection of an adequate data set is often a lengthy process requiring several months wait. The samples must be selected for the analysis on the basis of their source, their preparation, their composition and their age. The samples used in the calibration data set should closely match the samples to be encountered in the routine analysis. When a calibration has been properly completed, it should never have to be repeated unless the sample composition or preparation changes substantially. The quality of the calibration is determined by statistical comparison of the NIR analysis with the manual analysis of whatever component is to be measured.

The specific NIR instrument being used in this lab is the Infra-Alyzer (TM) 400 produced by Technicon Industrial Systems. This instrument uses 19 interference filters in a 20 position filter wheel to provide the necessary wavelength discrimination. The actual wavelengths passed by the filters are not normally used in calibration of the instrument.

Instead, the wavelength is referred to by the position of the particular filter in the wheel. In the calibration, a set of weighting or correlation coefficients are developed. These coefficients, called F-values, are then entered into the instrument which automatically uses them in the sample analysis.

The calibration data set is collected by analyzing the samples and transmitting the log (1/R) values to the microcomputer*, via a RS-232 serial interface. These log values are stored on a data cassette provided by Technicon Instruments Corporation. This cassette contains all the programs required to perform the regression analysis. The analysis is performed by selecting the filters to include and which samples should be deleted from the data set. The computer then calculates the F-values and a set of statistical indicators. These indicators are then used to judge the quality of the regression. By comparing the values of the indicators from one regression to the next, it is possible to decide on the validity of removing a filter.

The final regression must then be tested against a new set of samples. This testing requires the collection of manual and Infra-Alyzer (TM) analysis, both in duplicate. The standard deviations on both methods and the standard error of prediction can be calculated and compared. The standard error of prediction of the calibration is usually approximately the same as the standard deviations of the residuals calculated during the calibration. A residual is the difference between the predicted and the manual analysis values.

It is possible to develop a set of F-values called pre-calibrations. These are calculated from data collected from the analysis of many samples on several instruments. These pre-calibrations are provided by Technicon and require only a post-calibration check to set the instrument bias. For some types of samples, these pre-calibrations can cut the development time significantly.

One aspect of the analysis which has to be carefully controlled is the grinding and packing procedure. The sample should have a uniform ,consistant particle size. In the case of forage samples, each sample is ground twice before analysis. The packing procedure involves cleaning the window of the sample cup, overfilling and levelling the sample, and attaching a compression cover. The cup can then be placed in the Infra-Alyzer (TM) sample compartment drawer for analysis.

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*Hewlett-Packard Model 85 Desk Top Computer, Hewlett-Packard (Canada) Ltd., Mississauga, Ontario.

METHODS: The Infra-Alyzer (TM) was received in January of 1982 and a two-day training course was completed in February. A trial protein calibration was run on hay samples during the course. After the completion of the course, protein analysis of grass hay was selected to be the first calibration attempted. This was because of the availability of hay samples from a recent forage competition. Packing tests were conducted on the samples analyzed during the training course. The variations in log values measured on samples ground in the knife* mills indicated that regrinding in a cyclone** mill was necessary for forage samples so all samples were reground before analysis.

Manual analysis was run in duplicate on the samples and the data was added to the Infra Alyzer log values on the calibration tape. The regression analysis of the data on the competition samples was not good enough for use, so more samples were added, first old samples from the previous six months and then new samples as they arrived. This addition was not completed until August when a useful regression was achieved. At this point, acid-detergent fiber (ADF) data was added to the tape and a regression was performed.

In March, pre-calibrations were provided by Technicon for analysis of protein in wheat, two-row barley and six-row barley. These F-values were used to analyze grain samples which came in during August and September. The resulting data was used to set the instrumental bias correction for each product.

A pre-calibration was not available for oats so the same procedure had to be followed as in the case of grass hay. The regression analysis has been completed on a group of oat samples but the final calibration check is not complete.

RESULTS: The first regression analysis of the grass hay data set did not yield useable results. The residual standard deviation was too high to allow its use. In addition, the distribution of protein values was not uniform, and the range was too narrow. The addition of the older samples caused some improvement but more

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*Thomas-Wiley Laboratory Mill, Arthur H. Thomas Co., Philadelphia, PA.

**UDY Cyclone Sample Mill, U.D. Corporation, Boulder, CO.

TABLE I

Infra Alyzer (tm) Calibration Data for Protein And Fibre Analysis

F-Values as of 26/11/82

Filter Number	Grass Hay ADF	Grass Hay Protein	Wheat Protein	2-row Barley Protein	6-row Barley Protein	Oats Protein
00	13.95	10.56	16.8	17.98	17.43	15.86
02	0	0	0	0	0	0
03	188.7	0	0	0	0	0
04	0	0	0	0	0	0
05	406.4	-284.6	0	0	0	0
06	0	353.7	0	0	0	0
07	0	0	0	0	0	0
08	0	782.9	0	0	0	474.6
09	0	-650.3	0	0	0	0
10	-602.2	0	430.6	576.1	576.1	0
11	0	0	0	0	0	-59.84
12	2436	-875.2	0	0	0	-939.2
13	0	0	0	0	0	1052.
14	0	0	-289.5	-446.4	-446.4	-367.2
15	-4225	571.9	0	0	0	0
16	0	0	0	0	0	0
17	1603	0	0	0	0	0
18	0	0	0	0	0	0
19	199.7	101.3	0	0	0	-156.8
20	0	0	-209.5	-167.2	-167.2	0

% Constituent = $F_{00} + F_{02}L_{02} + F_{03}L_{03} + \ldots + F_{19}L_{19} + F_{20}L_{20}$ where L_{nn} represents the log (1/R) values as measured by the instruments.

samples were still required. When more hay samples came in during July and August, a useable calibration was feasible. In the post-calibration check, a standard error of prediction of 0.51% protein was calculated.

The ADF regression produced a residual standard deviation of about twice the magnitude found for the protein. The post-calibration check has not been completed but the regression statistics indicate that the regression should be useable.

The regression for protein in oats produced better results. The residual standard deviation was better than the value found for protein in grass hay. The post-calibration check has not been completed.

The pre-calibrations provided very good results after a typographical error in one of the F-values was discovered and corrected. The standard errors of prediction were calculated to be 0.29% protein for wheat, 0.32% protein for two-row barley and 0.43% for six-row barley.

In the post-calibration checks, the standard deviations of the manual analysis and of the Infra-Alyzer (TM) analysis were calculated. The standard deviations of the manual analysis range from 0.39% protein to 0.48% protein. For the Infra-Alyzer (TM), the values range from .03% protein to .13% protein.

The F-values that have been derived are listed in Table I.

DISCUSSION: NIR reflectance analysis provides a rapid method of feed analysis with precision comparable to the digestion methods used in this lab. The advantages of the method include reduced sample analysis time and less use of hazardous chemicals. The only critical areas in routine analysis are the grinding procedures and identification of the product. The product and constituent settings on the instrument must match the sample being analyzed.

The critical part of NIR reflectance analysis is the calibration of the instrument. The addition of samples to improve the constituent distribution produced some major changes on the F-values calculated. These changes suggest their application to checking for the stability of a complete regression analysis. If the changes which occur after adding a few more samples are small, the data set may be approaching a stable condition.

For a good calibration, the range the constituent values should cover is at least twenty (20) times the standard deviation of the manual method (5). Some relatively large differences in ADF values did not allow this condition to be met before the calibration was attempted. The high residual standard deviation attained in the ADF regression analysis reflects this fact. The most likely cures for this problem are the collection of more samples and the analysis of these samples in triplicate before further regression analysis.

One important consideration is the cassette tape which is used to store the programs and data required for the regression analysis. Only a single tape is provided and it is secured to prevent duplication. The programs do not allow the transfer of the data to a blank tape or other mass storage device, unless another computer is available, and a great deal of time is spent on developing programs to receive the transmitted data. The programs do allow the transfer of data to another program tape on the same computer. This means that the most practical way to avoid having to destroy data to begin a new regression is to buy several pre-programmed calibration tapes, at a cost much higher than the price of blank tapes.

RECOMMENDATIONS: In addition to the routine operation of the Infra-Alyzer (TM), it is necessary to continue evaluating and refining the calibrations. This is necessary to correct for changes in the crop conditions and to improve the accuracy of the analysis. This is particularly important for the grass hay calibrations which are not as reliable as the analysis of whole grain samples.

Other products should be added to the ones now being analyzed. Some candidates are legume forages, mixed forages and mixed rations. The data sets for these types of samples can be built up gradually as appropriate samples are received.

The analysis of non-feed products may also be possible. One such application is the analysis of percent organic matter in soils. This type of analysis will require investigation of the composition and properties of the organic matter and the overall soil matter. The method of sample preparation will require investigation as well.

Plant tissue analysis should be another area where the use of NIR reflectance may be possible. Analysis for protein based nitrogen should be possible. One problem to be overcome may be the correction of the manual analysis for the presence of nitrates and other forms of nitrogen. Another problem is the small sample volumes of some types of tissue. Large samples may be necessary or a modification to the sample cup may be possible.

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REFERENCES: (1) Rotolo, P. Cereal Foods World, 1979, 24, 94.

(2) Watson, C. A. Anal. Chem. 1977. 49, 835A.

(3) Hooton, D. E. Cereal Foods World, 1978. 23, 176.

(4) Technicon Industrial Systems, Industrial Method No. 334-74 W/B.

(5) Technicon Industrial Systems, Infra-Alyzer 400 Operation Manual, Technical Publication No. TA9-0398-00.

(6) Technicon Industrial Systems, Infra-Alyzer 400 Training Course Guide.

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